

# Mesenteric Volvulus in US Military Working Dogs



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# United States Army Veterinary Corps

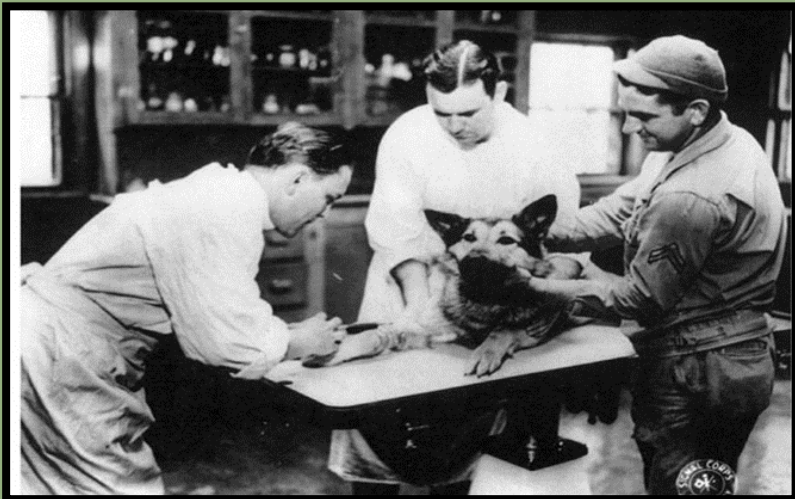
- Established in 1916 WWI
- 3400 personnel
- 600 Veterinary Corps Officers
- Mission:
  - Public health, animal medicine, food safety
- Services entire Department of Defense:
  - Army, Navy, Air Force, Marine Corps, Coast Guard





# Military Working Dog Program

- Over 2,400 dogs
- Procured from Eastern Europe, breeding program in Texas
- Force protection multiplier
  - Patrol, detection (explosive, narcotic), security
- Belgian and German Shepherds, Belgian Malinois



“The capability they (MWDs) bring to the fight cannot be replicated by man or machine. By all measures of performance their yield outperforms any asset we have in our inventory. Our Army (and military) would be remiss if we failed to invest more in this incredibly valuable resource.”

– GENERAL DAVID H. PETRAEUS



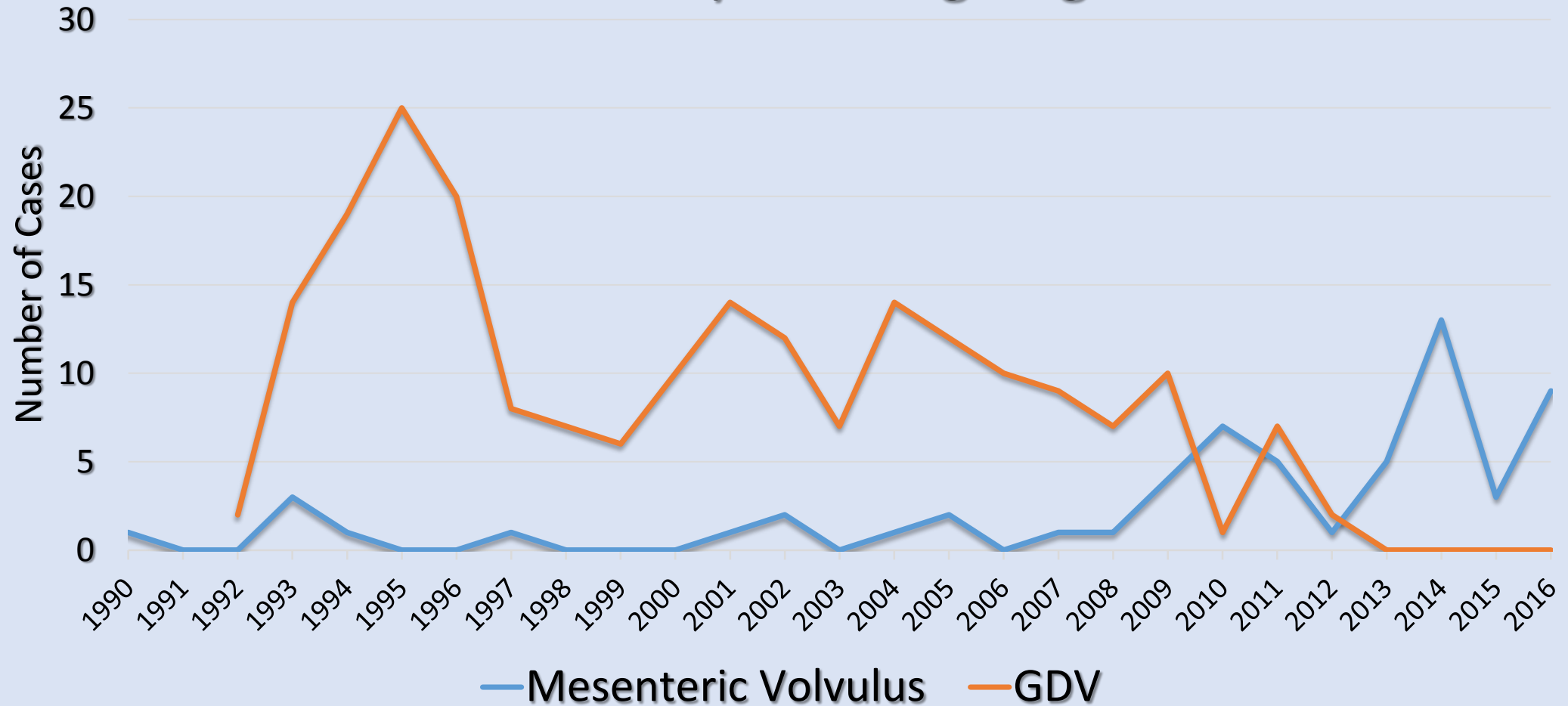
# Causes of death or reasons for euthanasia in military working dogs: 927 cases (1993–1996)

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Margaret N. Carter, DVM, MS, DACVPM; Michael R. Peterson, DVM, DrPH

Cause of death or euthanasia	No. (%)	Mean age (y [SD])	Range (y)
Appendicular DJD	178 (19.2)	10.37 (1.69)*	2.77–14.20
Neoplasia	170 (18.3)	10.02 (1.79)	4.08–14.71
Spinal cord-cauda equina disease	145 (15.6)	10.35 (1.57)	6.05–14.44
Geriatric	131 (14.1)	11.31 (1.40)*	5.68–14.57
Gastric dilatation-volvulus	84 (9.1)	8.88 (2.24)†	2.07–13.41
Cardiac disease	34 (3.7)	9.72 (2.75)	2.67–14.03
Behavior	19 (2.0)	8.36 (3.06)	2.44–12.69
Urogenital disease	17 (1.8)	10.22 (3.06)	2.04–13.65
Gastrohepatic disease (nonGDV)	16 (1.7)	9.32 (2.31)	2.85–12.48
Ophthalmologic disease	11 (1.2)	9.90 (1.90)	6.74–12.53
Anesthetic arrest	10 (1.1)	7.34 (1.99)†	3.57–10.23
Axial skeletal DJD	9 (1.0)	9.02 (2.59)	3.95–12.46
Respiratory tract disease	9 (1.0)	9.74 (2.62)	5.31–12.95
Trauma	9 (1.0)	9.09 (2.30)	6.36–13.64
Dermatologic disease	8 (0.9)	8.98 (1.65)	6.17–11.09
Brain disease	8 (0.9)	9.51 (2.00)	6.71–12.67
Heat stroke	6 (0.6)	5.80 (1.99)†	2.97–8.75
Endocrine disease	5 (0.5)	11.61 (1.65)	9.07–13.49
Miscellaneous	16 (1.7)	9.15 (2.83)	3.04–14.41
Indeterminable	42 (4.5)	9.92 (2.13)	4.02–13.41
<b>Total</b>	<b>927 (100)</b>	<b>10.06 (2.08)</b>	<b>2.04–14.71</b>



## Mesenteric Volvulus vs GDV Deaths in Military Working Dogs



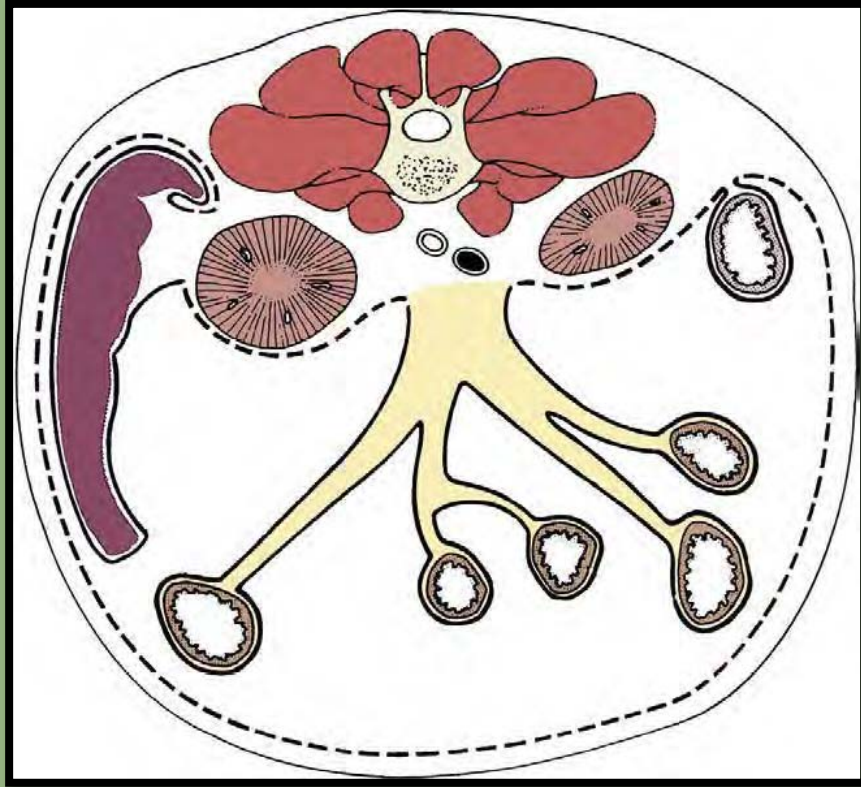
# Mesenteric Volvulus vs GDV Deaths in Military Working Dogs

Date Range	Mesenteric Volvulus	GDV
1990-2000	6	116
2001-2009	12	95
2010-2016	48	11
<b>TOTAL</b>	<b>66</b>	<b>222</b>

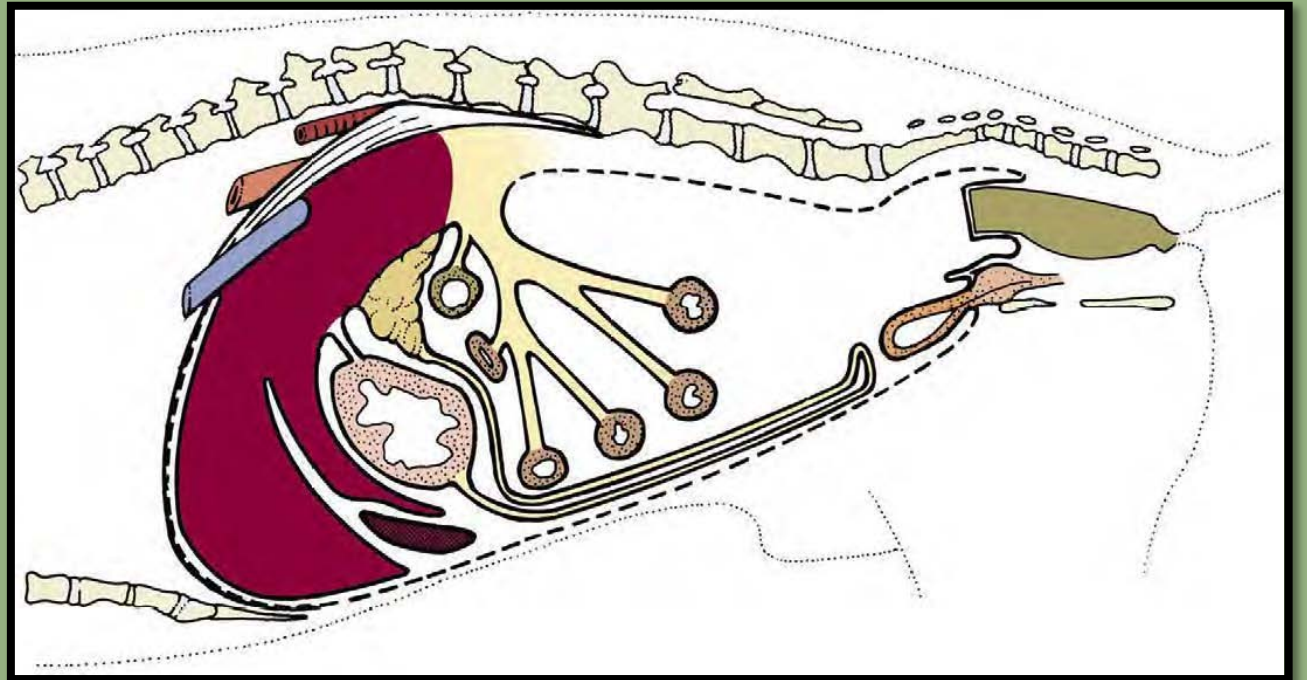


# Mesenteric Volvulus

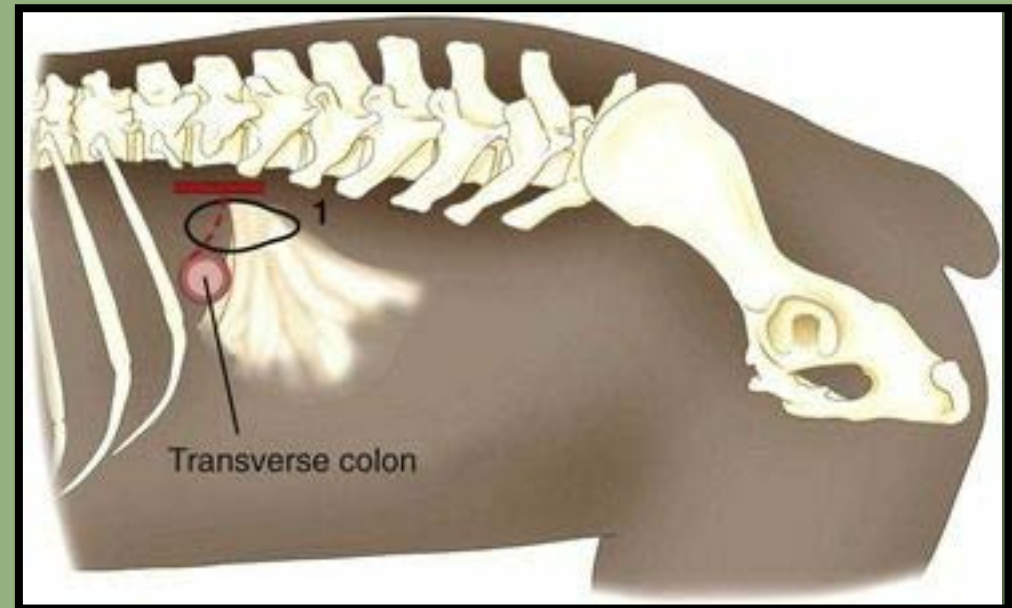
- Uncommon, fatal
- Occurs in many species
  - Horses, cattle, swine, dogs and humans
- Intestinal rotation around the root of the mesentery
- Obstruction of cranial mesenteric vessels/branches
- Death attributed to vascular obstruction, intestinal anoxia, circulatory shock, endotoxemia and cardiovascular failure
- Torsion vs. Volvulus



Textbook of Veterinary Anatomy, 4ed. 2010



Textbook of Veterinary Anatomy, 4ed. 2010



Veterinary Surgery, Tobias & Johnston 2012

# Etiology

- Unknown
- Certain associations have been hypothesized:
  - Recent GI surgery
  - Lymphocytic-plasmocytic enteritis
  - Parvoviral infection
  - Vigorous exercise
  - Exocrine pancreatic insufficiency
  - Intussusception/GI foreign body
  - Concurrent GDV
  - Ileal carcinoma
- Humans: congenital most common in young children

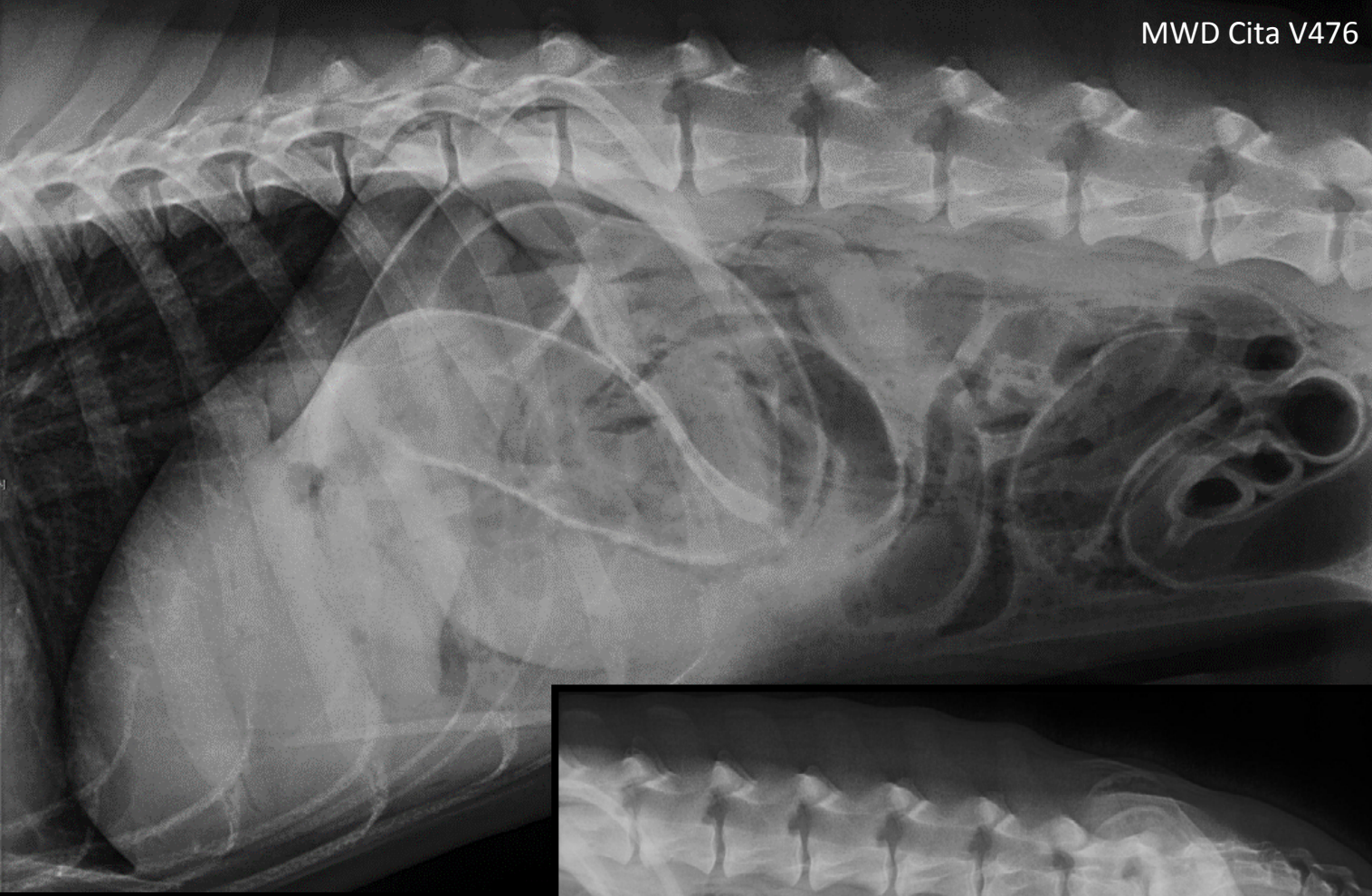


# Clinical Features

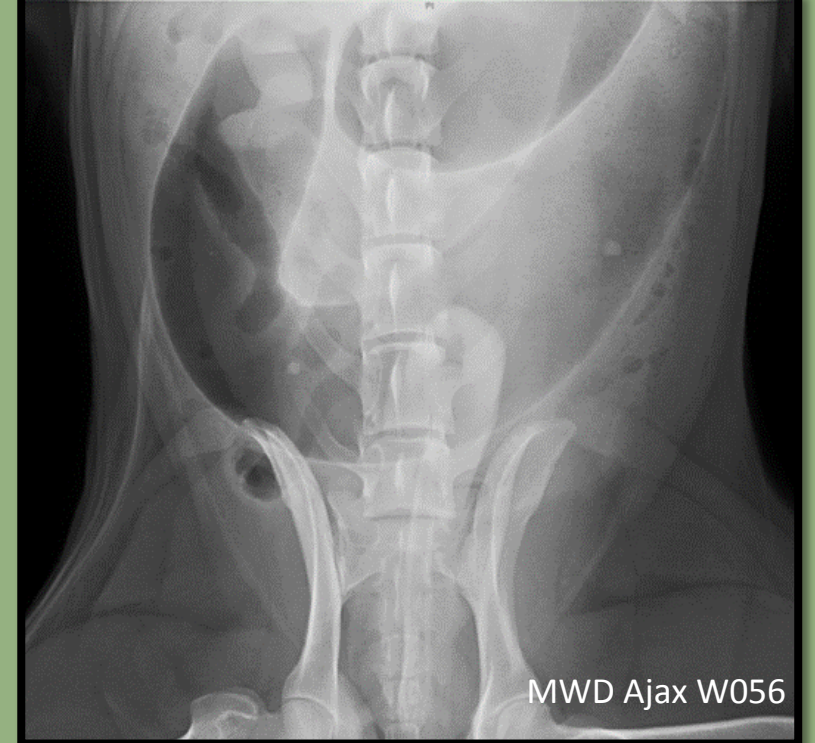
- Adult, male, large-breed dogs
  - German Shepherd Dog
- Peracute/acute onset
  - vomiting, abdominal distension, shock, hematochezia, tenesmus
- Rapidly progression of clinical signs leading to death is the most typical clinical feature
- Diagnosis challenging, nonspecific clinical signs
- Abdominal radiographs







MWD Cita V476



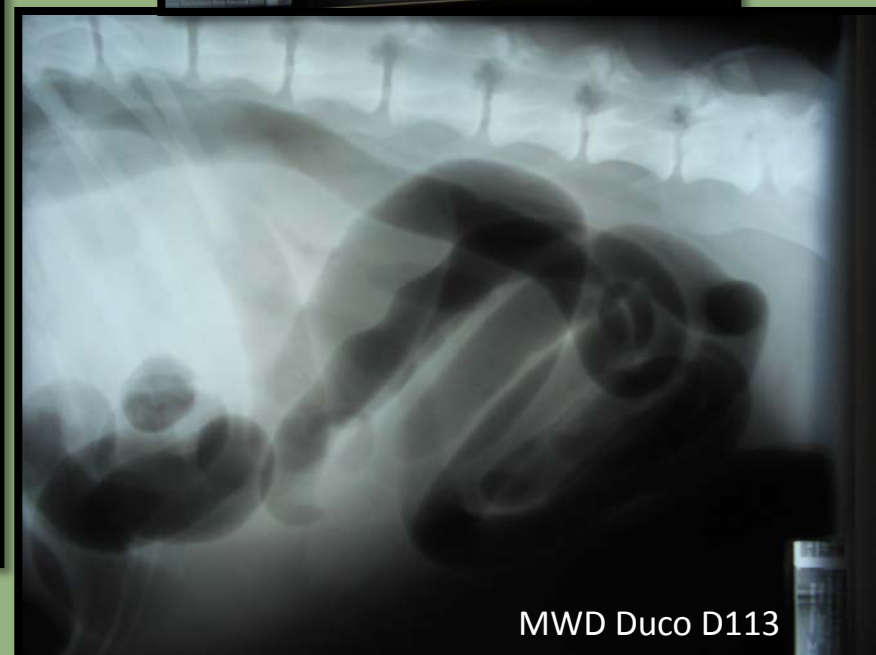
MWD Ajax W056



MWD Cita V476



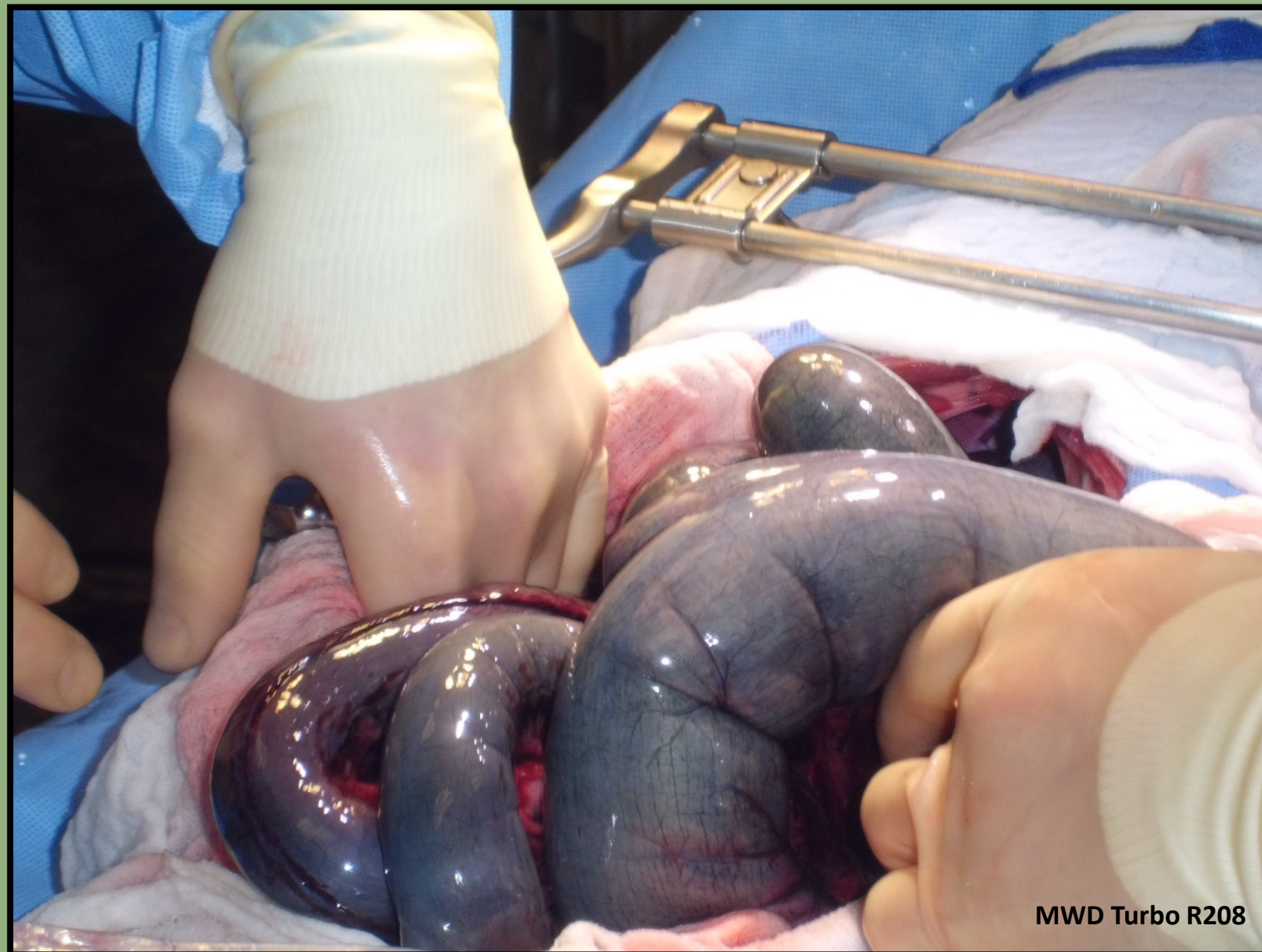
MWD Ajax W056





# Treatment

- Initial aggressive stabilization
- Immediate surgery for reduction of obstructed mesenteric root
  - Derotation, derotation with resection/anastomosis
  - Gastropexy and/or colopexy
- Prognosis: grave, despite early detection and intensive management
- Mortality 58-100%

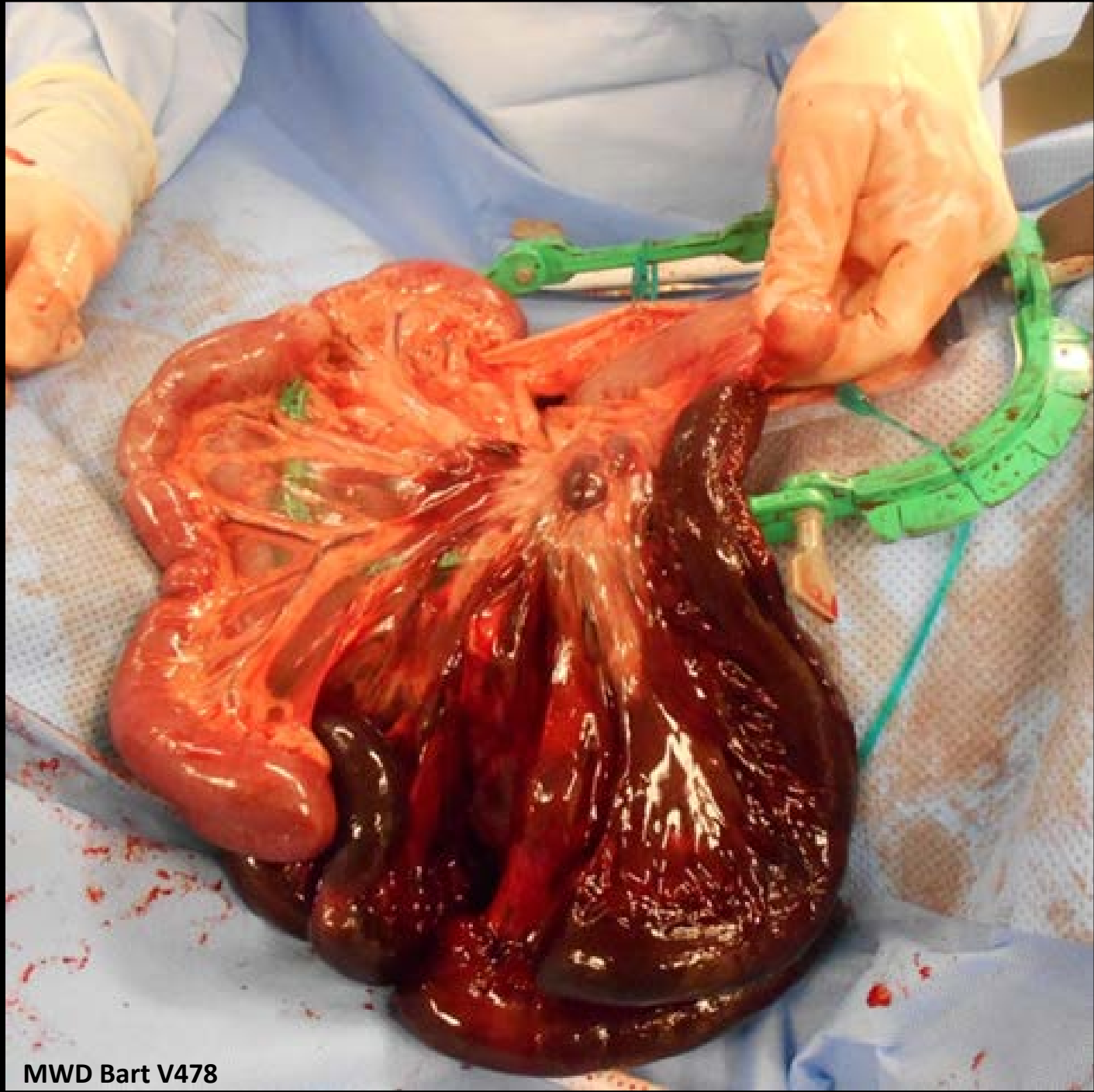


MWD Turbo R208

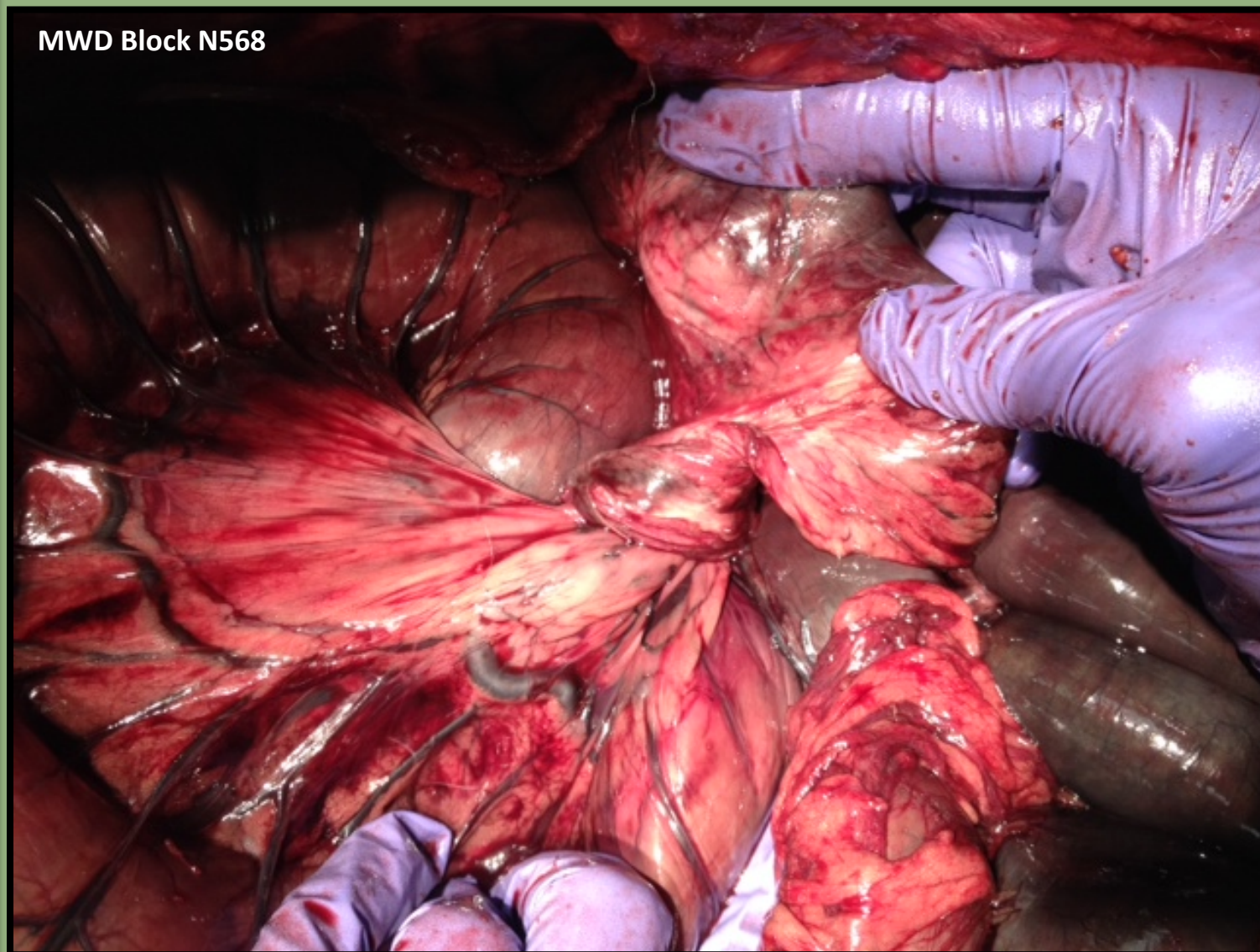
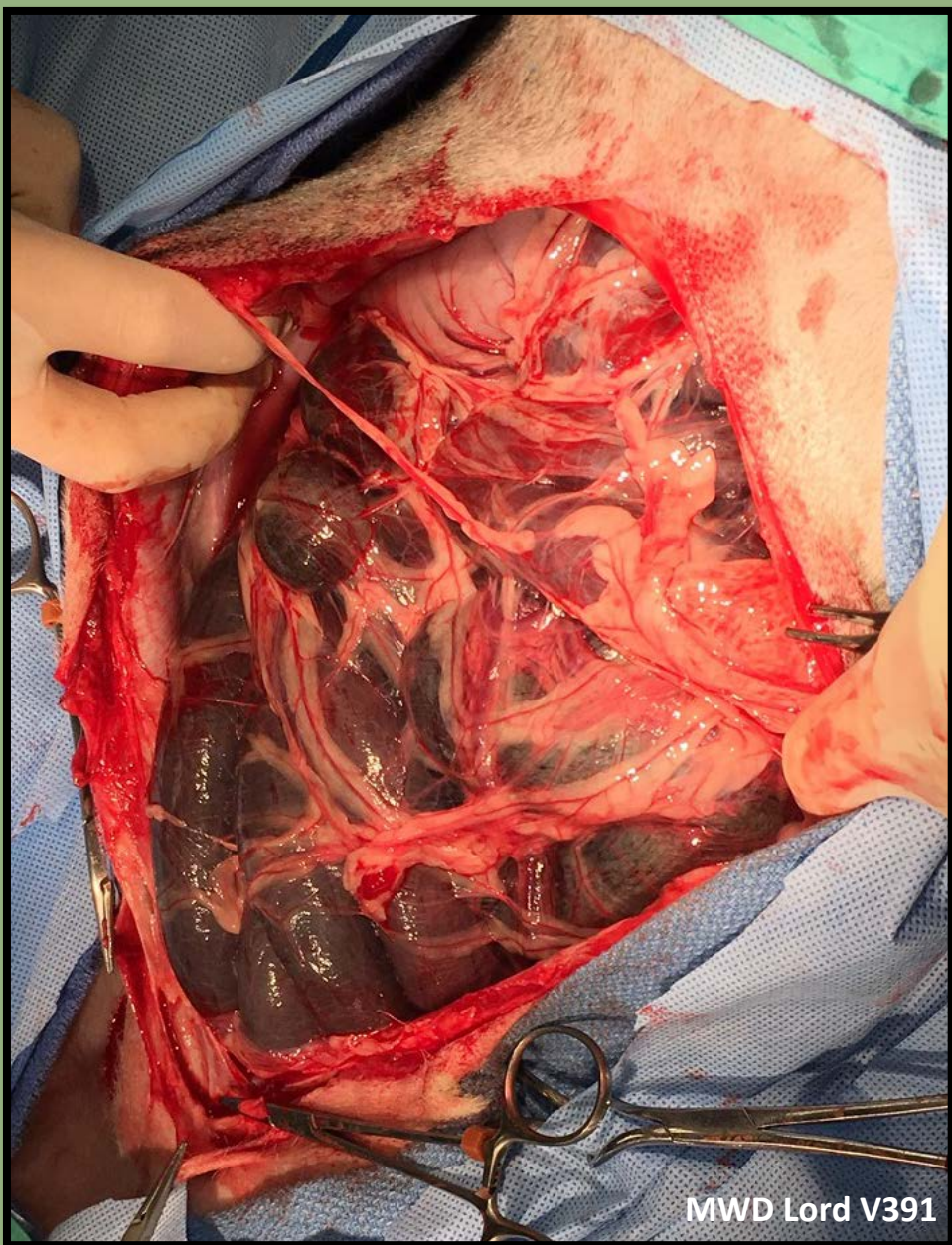


MWD Kazan N349

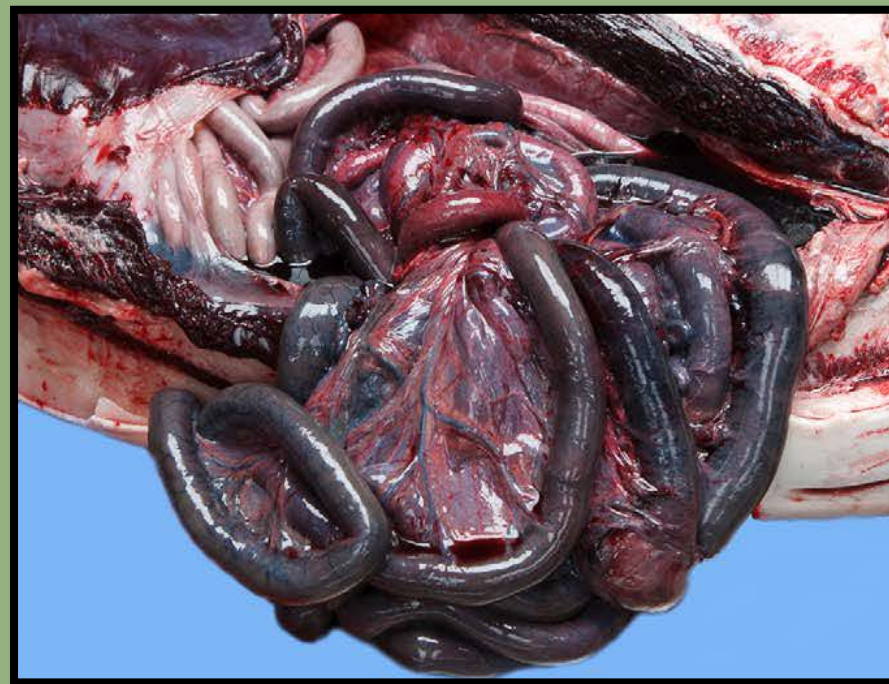














# Current literature

- Since 1972
  - 13 reports
  - 72 cases of MV
- Majority are case reports
- Small sample sizes
- Lack control population

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Veterinary Surgery, 21, 1, 15-19, 1992

## Canine Intestinal Volvulus A Report of Nine New Cases

PAUL M. SHEALY, MS, DVM, and RALPH A. HENDERSON, DVM, MS, Diplomate, ACVS, ACVIM

The records of nine dogs with intestinal volvulus were reviewed. Most were young adult (median 2.6 years) males (6/9) of medium to large breeds. Vigorous activity, dietary indiscretion, or trauma preceded volvulus. Signs included a peracute to acute onset of vomiting, hematochezia, a moderately distended and often painful abdomen, and shock. Normal packed cell volume, altered white blood cell count, hypoproteinemia, hypoalbuminemia, hypokalemia, pathologic bowel dilatation, and serosanguineous abdominal fluid were common clinical findings. Jejunum was most often affected. One dog survived with surgical management.

IN ALL SPECIES of domestic animals, portions of the intestines are held in relatively fixed locations by attachments to parietal peritoneum or adjacent viscera. Other bowel segments are suspended by mesentery, which provides greater freedom of movement. Movement and physiologic twisting or turning of suspended bowel occurs during physical activity and normal peristalsis.<sup>1</sup> If mesenteric attachments fail to prevent excessive rotation, twisting of the bowel on the suspending mesentery results in vascular compromise, tissue ischemia, and luminal obstruction. Pathologic twisting of bowel on its mesenteric axis is termed intestinal or mesenteric volvulus and is distinct from intestinal torsion (twisting upon the long axis), although they may occur simultaneously.

Small and large intestinal volvulus is most common in humans, horses, cattle, and swine.<sup>1,2</sup> Small intestinal volvulus occurs more commonly. Intestinal volvulus is relatively uncommon in dogs. Only 57 cases of canine intestinal volvulus have been reported in the North American literature,<sup>1,3-11</sup> and one case was reported in a South African journal.<sup>12</sup> The disease is rare in cats.<sup>13</sup>

The cause of canine intestinal volvulus has not been determined, but certain associations have been elucidated from historic, diagnostic, surgical, and postmortem data. Vigorous exercise, closed abdominal trauma, recent gastrointestinal surgery, plasmocytic enteritis, treatment of severe ascariasis with piperazine, exocrine pancreatic insufficiency, chronic ileocolic intussusception, ileal carci-

noma, concurrent gastric dilatation-volvulus, and gastrointestinal foreign bodies have been associated with intestinal volvulus.<sup>3,4,6,7,9-12</sup>

In humans, the term secondary volvulus is applied when rotation follows abnormal fixation by acquired or congenital lesions. Rotation without an obvious cause is termed primary volvulus. Anatomic factors that potentiate mobility, motility, and primary volvulus include the absence of mesenteric fat, a narrow mesenteric root, excessive mesenteric length, and increased bowel length.<sup>14</sup> Prolonged exercise, abdominal trauma, constipation or diarrhea, and pregnancy are associated with intestinal volvulus in humans.<sup>14</sup> The incidence of volvulus is higher in cultures where bulky, high residue vegetable and cereal diets are common, especially with rapid filling of an empty bowel with large quantities of poorly digestible diets.<sup>14</sup> Very active peristalsis is required to move such a heavy bolus, and rotation may develop. In domestic animals other than dogs, particularly horses, swine, cattle, and sheep, diets resulting in excessive gas production or hypermotility, or both, promote bowel displacement.<sup>2,15,16</sup>

Intestinal volvulus is associated with an extremely high mortality rate. The literature contains only two reports of successful management of intestinal volvulus in dogs.<sup>3,12</sup> Death is usually attributed to a cascade of vascular obstruction, intestinal anoxia, circulatory shock, endotoxemia, and cardiovascular failure. Severity may increase with derotation and reoxygenation, the so-called "reper-



# Identification of risk factors for mesenteric volvulus in military working dogs: a case control study, 54 cases (1990-2014)

- **Objective:** To identify risk factors for mesenteric volvulus in military working dogs.
- **Design:** Retrospective case control study.
- **Animals:** 54 MWD affected with MV and 162 unaffected control dogs.
- **Procedures:** Medical records for MWD with a diagnosis of MV based on exploratory laparotomy or confirmed at necropsy were reviewed.

# Case Selection/Medical Record Review

- Medical records searched from 1990-2014
- Following inclusion of an affected MWD, 3 unmatched control MWD records were randomly selected with similar birth year
- Volvulus date = Event date
- 54 affected MWD (cases)
- 162 unaffected MWD (controls)



# Factors Analyzed

- Breed
- Gender
- Neuter status
- Age
- Weight
- Body condition score
- SID/BID feeding
- Deployability category
- Type of training
- Medications at time of MV/event
- NSAIDs at time of MV/event
- Prophylactic gastropexy
- History of GDV
- History of gastrointestinal disease
- History of abdominal surgery between gastropexy and MV/event
- History of abdominal surgery within 1 week of MV/event
- History of aggression
- Aggressive temperament
- History of bite quarantines
- History of behavior consultation
- Diagnosis of canine PTSD

# Factors Analyzed

- Weather:
  - Absolute and differential measures:
    - Temperature (°C)
    - Barometric Pressure (mB)
    - Humidity (%)
  - Presence/absence of thunderstorms (# hours)
  - Each for day -3, -2, -1, 0





# Results

- 54 cases of MV identified 1990-2014
- 50/54 were either euthanized or died soon after MV
- Five control records were incomplete
- 157 control records were reviewed



# Results

	Odds Ratio	95%		P value
		Confidence Limits		
GSD	11.5	3.1	42.0	0.0002
Age	2.0	1.6	2.8	<0.0001
Prophylactic Gastropexy	65.9	10.4	417.6	<0.0001
History of GI disease	5.4	1.1	25.7	0.04
Other Abdominal Surgery	16.9	1.0	298.3	0.05
NSAIDs at time of MV/event	5.2	0.9	30.4	0.07

# Post hoc analysis-Gastropexy

- 108/211 MWD received a prophylactic gastropexy
- 40/108 developed MV (54 cases)
- Type of gastropexy
  - Incisional, laparoscopic assisted, right paracostal grid ( $P=0.29$ )
- Post-operative complications ( $P=0.01$ )
  - Dehiscence, improper gastropexy site in one control MWD, seroma, and incisional infection.
  - Incisional infections-most common type of complication
  - Majority of MV occurred at least one year after the prophylactic gastropexy was performed.
- Surgeon experience performing gastropexy

# Conclusion

- MV remains an uncommon yet often fatal condition affecting dogs.
- Previous reported risk factors: breed (GSD), age and history of GI disease.
- Additional risk factors: prophylactic gastropexy and other abdominal surgery.
- No association with weather, type of training program, behavior
- Impact of NSAID use may be associated with MV and warrants investigation.
- Despite the association between MV and gastropexy, we remain supportive of this prophylactic procedure for the more common disease of GDV.



# Take home

- German Shepherd Dog
- Middle age
- History of GI disease
- Prophylactic gastropexy
- Other abdominal surgery
- Currently taking NSAIDs

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- Bryden J. Stanley BVMS, MACVSc, MVetSc, DACVS

