Gastric dilatation and volvulus with partial splenectomy in a dog.

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Abstract

Gastric dilatation and volvulus (GDV) is an acute life-threatening condition that is characterized by a rotation of the stomach that can lead to many systemic disturbances. A seven-year-old male neutered German Shepherd Crossbred Dog presented with an acute onset of retching and lack of appetite for the last 12 hours. Clinical examination and radiographic study was consistent with GDV. The patient underwent pre-surgical medical stabilisation before exploratory celiotomy. During surgical correction of GDV, the spleen was found with a focal area of congestion. It was confirmed an avulsion of short gastric vessels and gastrosplenic ligament. Partial splenectomy and an incisional gastropexy were performed. The patient recovered well but experienced anorexia and abdominal pain after surgery. Lateral right abdominal radiograph revealed a large amount of liquid and gas in stomach that was readily aspirated with a nasogastric tube. After 48h of hospitalisation the patient was discharged with normal appetite.

Introduction

GDV is commonly seen in large and giant breed dogs but it is not clear yet if the stomach dilates first and then rotates or if it rotates first and then dilates[5]. Although the pathogenesis is not well understood there has been suggested that the risk factors can be classified as intrinsic (large/giant breeds, body condition, temperament, age) and extrinsic factors (type of diet, frequency of meals, feeding bowl height, moment of exercise) [16,12].

Dogs are usually presented with history of unproductive vomiting, retching, and hypersalivation. On a physical examination, the abdomen is normally distended and on percussion, a tympanic sound is produced. The patient may start showing symptoms of hypovolemic shock and may present in laterally recumbent with tachypnea[13,19].

A right lateral radiograph of the cranial abdomen should be taken in order to differentiate between gastric dilation (GD) and GDV[7,14,13].

This emergency condition can lead to organ dysfunctions including cardiovascular, respiratory, gastrointestinal (GI), coagulation and renal dysfunction as well as acid-base and electrolyte abnormalities[17].

Plasma lactate concentration can help guide prognostication and it has been suggested that an initial plasma lactate concentration cutoff of 7.4 mmol/l was 82% accurate for predicting gastric necrosis and a final lactate measurement <6.4 mmol/l has been associated with 91% survival rate.[3,14]. A retrospective analysis of 736 cases of GDV performed by KK. Song et al. suggested that admission time, stabilizing the patient and completing the surgical correction of GDV as soon as possible decrease the mortality rate[18].

In the initial management of GDV orogastric tubing and gastric trocarization are two safe methods of gastric decompression associated with low complication rates[9].

For the surgical treatment, many techniques have been studied but both incisional gastropexy (IG) and belt-loop

gastropexy have been reported as clinically effective in treating GDV, with no significant difference in survival rates[18].

Also, modified tube gastropexy using a mushroom-tipped silicone catheter has been proposed as a safe surgical method for the management of GDV[4].

Splenectomy, gastrectomy and gastric invagination are other concurrent surgical techniques that are sometimes performed during the same procedure depending on the viability of the spleen and the gastric wall[15].

Intensive post-operative management and pain management are essential for patient survival. It is important that the patient is controlled closely in order to prevent and prematurely identify ischemic-reperfusion injury and other potential post-operative serious complications[7].

It is possible to perform prophylactic gastropexy (including minimally invasive techniques) in order to prevent GDV in certain large and giant breeds[1,8].

Despite appropriate medical and surgical treatment, short-term mortality of dogs suffering GDV is around 16%, but the factor that was associated with a significant decrease in the overall mortality rate in some studies was the time from presentation to surgery[2,11.]

History

A 7 years old, 32kg, male neutered, German Shepherd Crossbred Dog, presented with retching and anorexia after last ate. No previous history of gastrointestinal problems.

Clinical examination

Retching was noted in consult room while taking the clinical history from the owner. On physical examination the patient was bright, alert and responsive, 4/9 body score, mucous membranes were pale pink and moist, capillary refill time was less than two seconds. Rectal temperature was normal (38.5°C), abdominal palpation was tense and mildly distended but not painful, on cardiopulmonary auscultation there was nothing abnormal detected, heart rate was 124bpm and respiration rate was 32brpm. The rest of the physical examination was unremarkable.

Problem list & differential diagnoses

These differential diagnoses list below are ranked in order of most likely etiology, based on the most significant clinical symptoms (abdominal distension and nausea/retching), clinical history and clinical examination findings.

Abdominal distension:

- GD
- GDV
- Ascites
- Neoplasm
- Splenic torsion
- Prostatic cyst
- Acute gastroenteritis
- Gastric motility disorder
- GI obstruction
- Septic peritonitis
- Intestinal volvulus
- Hemoabdomen

Nausea/retching:

- GI inflammation
- GI obstruction
- Oesophageal foreign body
- Abdominal disorders
- Gastroduodenal ulcers
- Systemic disease
- Uraemia
- Toxins/endogenous/poisoning
- Drugs
- Adverse food reactions
- Neurologic disease
- Parasitism
- Motion sickness, pain, heat stroke, anaphylaxis

Diagnostic tests

Intravenous (IV) catheter was placed and blood sample was taken for comprehensive blood test.

Haematology was unremarkable apart from the low reticulocyte hemoglobin content (RETIC-HGB) that might be due to inflammation. Mild lymphopenia with no leucopenia was likely part of a stress leukogram, platelets were low but manual count confirmed 63000 cells/µL (with clear clumps visualized on blood smear). Biochemistry was unremarkable (See Appendix 1).

Paracetamol (Paracetamol 10mg/ml solution for infusion; B.Braun) was administered at 10mg/kg IV q8h,

maropitant (Prevomax 10 mg/ml solution for injection for dogs and cats; Dechra Veterinary Products Ltd) at 1mg/kg IV q24h, buprenorphine (Buprelieve 0.3mg/ml solution for injection for dogs, cats and horses; Jurox animal health) at 20 micrograms/kg IV q8h and based on pain score (Glasgow composite pain scale). Intravenous fluid therapy (IVFT) was started with Hartmann's solution (Vetivex 11; Dechra Veterinary Products Ltd) at 2ml/kg/h.

Conscious point-of-care ultrasound revealed no free fluid, no evident masses and a normal pylorus. The stomach was mildly enlarged and filled with fluid.

Next morning, he was still tense and on this occasion painful on abdominal palpation and quiet in kennel. Methadone (Methadyne, methadone hydrochloride 10mg/ml solution for injection for dogs and cats; Jurox animal health) was started at 0.3mg/kg IV q4h instead of buprenorphine. The owner was contacted and offered radiography and full abdominal scan.

The patient was mildly sedated with medetomidine (Sedator, medetomidine hydrochloride 1.0 mg/ml solution for injection for cats and dogs; Dechra Veterinary Products Ltd) at 10 micrograms/kg IV. On right lateral abdominal radiography there was a clear accumulation of gas in stomach giving a "reverse C" or "double bubble" considered pathognomonic image of GDV (Fig 1).

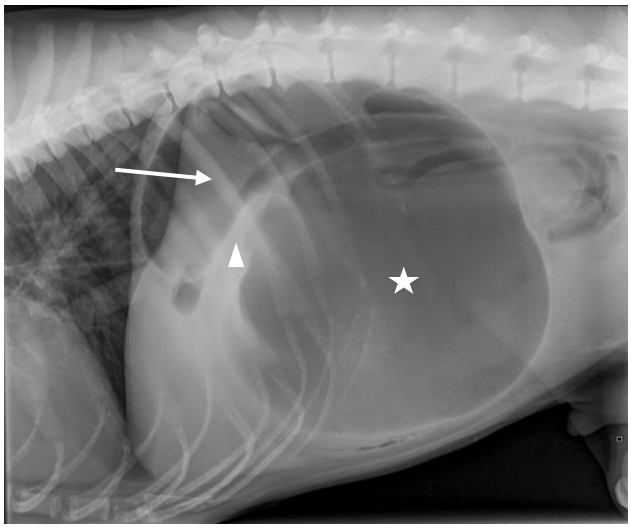


Fig 1. Right lateral abdominal radiography showing signs of air trapped in the pylorus (arrow) separated from the gas in the stomach (star) by a fold of soft tissue radiopacity (arrow head).

Diagnosis

Gastric dilatation-volvulus (GDV)

Treatment and case management

No further imaging was needed and protocol for GDV was immediately started. Non-invasive blood pressure was measured with the oscillometric of a multi-parameter monitor. Systolic blood pressure (Syst. BP) was recorded as 128 mmHG and a second IV was placed in the other cephalic vein. Hydration status and blood pressure were within normal limits but 10ml/kg bolus of fluids was given to improve blood perfusion before surgical procedure. 14-gauge IV catheter was used to decompress gas from the stomach percutaneously on left flank where gas protruded more. Electrocardiogram showed normal sinus rhythm and blood sample was taken to measure electrolytes and lactate (all parameters within the normal limits) (See Appendix 1).

Propofol (Propofol-lipuro 10mg/ml emulsion for injection; Virbac, B Braun) 2-4mg/kg by incremental doses to effect and an appropriate sized cuffed endotracheal tube was placed. General anaesthesia (GA) was maintained with isoflurane (Isoflurane 100% w/w inhalation vapour liquid; Merial Animal Health Ltd.) in 100% oxygen. Urinary catheter was placed.

Intravenous antibiotic was given (Zinacef cefuroxime sodium 1.5g powder for injection solution; Glaxo Smith Kline) at 30mg/kg at induction and repeated every 90 minutes until recovery. The ventral abdomen was clipped of and aseptically prepared and scrubbed for surgery with chlorhexidine (Hibiscrub, 4%w/v cutaneous solution chlorhexidine gluconate 40mg/ml; Mölnlycke Health Care AB).

A ventral midline from xifoid to pubis parapenile celiotomy was performed and falciform fat was removed with diathermy and a single square knot individual ligature with 3.5 metric Polydioxanone (PDS II, Ethicon). Gosset abdominal wall retractor was placed over moistened laparotomy swabs on both sides of abdominal wall.

The stomach was identified in a rotated position of 180 degrees ventrally to the left, the pylorus was found on the left ventral abdomen and the body of the stomach on

dorsal abdomen. No free fluid or active bleeding was observed.

The stomach was repositioned to its normal position by gently grasping the pylorus and bringing it ventrally towards the right side with the surgeon's right hand while the left one was pushing the body of the stomach dorsally.

The manoeuver was done smoothly and once the stomach was in normal position a systematic evaluation of the abdomen was undertook including checking the oesophagus.

The tail and the body of the spleen had a good colour but the head was darker purple-red colour and clearly enlarged with a well demarcated line (Fig 2).

Avulsion of the short gastric vessels from the greater curvature of the stomach was identified and it was suspected that the head of the spleen had been traumatically avulsed from its attachment to the stomach by the short gastric vessels and gastrosplenic ligament.

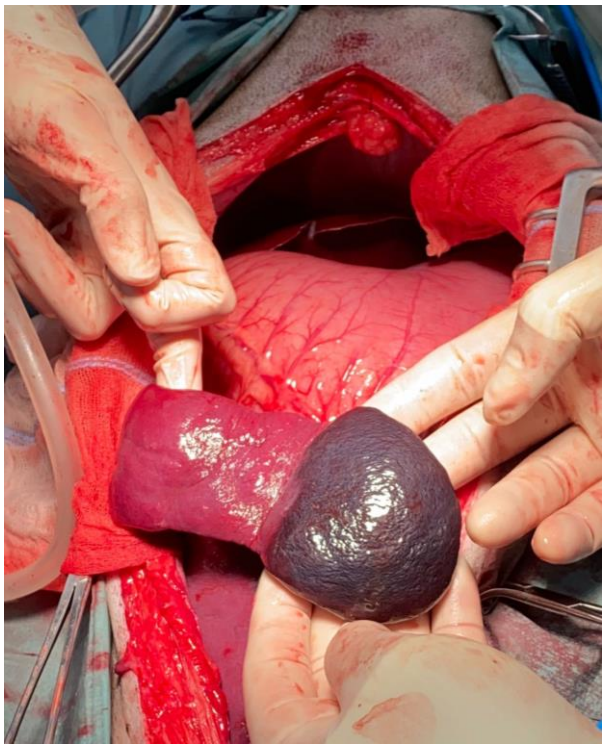


Fig 2. Well demarcated line between congested and normal spleen.

Partial splenectomy was performed by sharp dissection. The body of the spleen was clamped between the assistant fingers to control haemorrhage while the capsule was sutured with simple continuous appositional pattern with 3 metric poliglecaprone 25 (Monocryl, Ehicon) to achieve hemostasis (Fig 3). No bleeding was confirmed after releasing the pressure made with the assistant's fingers.

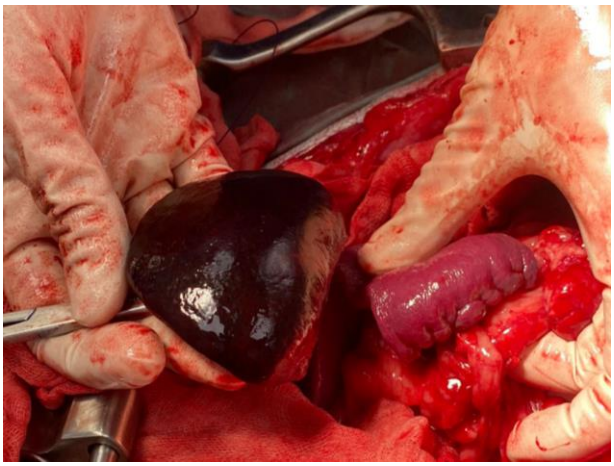


Fig 3. Partial splenectomy performed. See the head of the spleen resected and the healthy spleen with simple continuous suture pattern.

Gosset retractors were removed and a less vascularized portion of the ventral surface of the pyloric antrum was selected to perform the incisional gastropexy (IG). A longitudinal incision 5cm length was performed through the serosa and muscular layer of the stomach. Another incision was made inside the abdominal wall, 2cm caudal to the last rib, in a relaxed anatomical position that matches with the cut performed in the stomach and goes through the transversus abdominis muscle. Simple continuous appositional pattern using 3 metric Polydioxanone (PDS II, Ethicon) was used, starting with the craniodorsal edge (Fig 4).

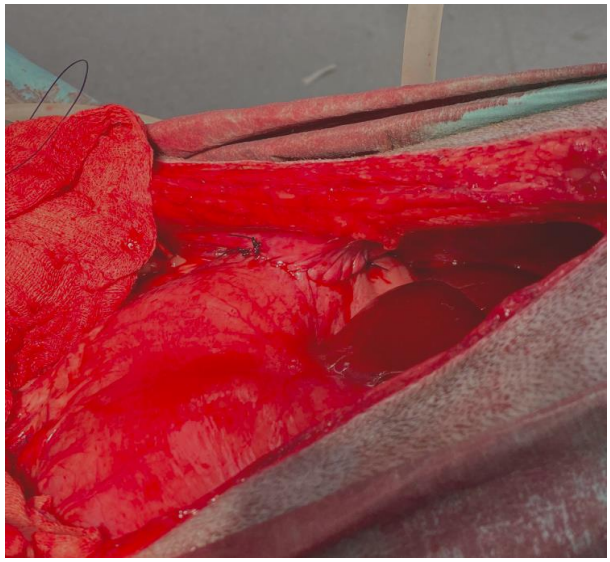


Fig 4. Incisional Gastropexy

Abdomen was suctioned to remove blood clots and free fluid.

Abdominal muscular layer was closed using 3.5 metric Polydioxanone (PDS II, Ethicon) in a simple continuous appositional pattern incorporating the fascia of the rectus abdominis muscles and reinforced with 3 intermittent Aberdeen knots.

The muscular wall was infiltrated with bupivacaine (Marcain polyamp steripack 0.5% bupivacaine hydrochloride solution for injection; Astra Zeneca) at 2mg/kg.

3 metric poliglecaprone 25 (Monocryl, Ehicon) was used to perform a simple continuous pattern in the subcutaneous tissue and a simple continuous intradermal suture to close the skin.

The patient stayed in hospital overnight with methadone at 0.3mg/kg IV q4h, paracetamol at 10mg/kg IV q8h, maropitant at 1mg/kg IV q24h and omeprazole (Omeprazole sodium 40mg powder for solution for infusion; Sandoz a Novartis company) at 1mg/kg IV every 12h were. The next morning, on physical examination, abdominal palpation was painful and tense with tympany. Light sedation was given with medetomidine at 10 micrograms/kg IV and right lateral abdominal radiography was performed and the stomach was found dilated with gas and liquid (Fig 5).

A 12fr nasogastric flexible tube was placed and decompression of gas and liquid was achieved.

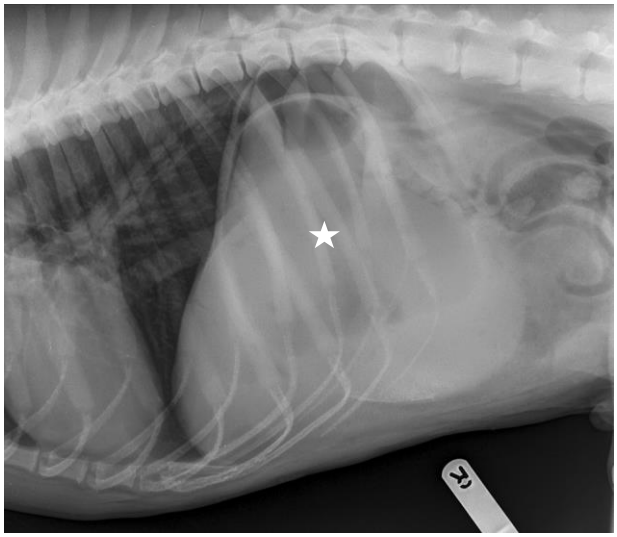


Fig 5. Right lateral abdominal radiography showing the gastric dilatation (star).

Metoclopramide (Vomend, metoclopramide hydrochloride 5mg/ml; Dechra Veterinary Products Ltd) 1 mg/kg over 24h in a continuous rate intravenous infusion (CRI) was started.

Once voluntary eating metoclopramide CRI was slowly tapered down. The patient was discharged with omeprazole (Omeprazole 40mg, gastro-resistant hard capsules, Crescent Pharma Limited) one capsule orally once a day for 10 days. Also discharged with paracetamol (Pardale-V oral tablets, 400 mg paracetamol and 9 mg codeine phosphate; Dechra Veterinary Products Ltd) 2 tablets orally every 8 hours for 5 days.

Prognosis and outcome

Abdominal wound healing was uncomplicated and patient progressed satisfactorily at home.

Taking into account several factors prognosis is favourable in this case. He was presented bright and alert with no previous underlying diseases, suffered no hypotension at any point, did not develop peritonitis, DIC or sepsis. Medical and surgical treatment was instituted as soon as possible. During surgical procedure, there was no gastric necrosis and lactate never was raised. All off these factors have been demonstrated as prognosis indicators by several studies[2,7,12,14,18]

Discussion

This case report describes an a-typical presentation of GDV with common clinical signs like retching and anorexia but in this case, the progression of GD to GDV was slow with a subtle deterioration before diagnosis (he was quiet in the kennel, still not interested in food and painful on abdominal palpation the morning after admit). His blood tests were within reference ranges since presentation and other measured parameters showed minimal systemic effects and fortunately, a stable patient (syst BP 128mmHG, lactate 0.97mmol/L)[3,14]. It was suspected that the patient came with GD and became GDV overnight. The other possibility was that the stomach twisted during the first sedation.

Normally, during the physical examination of an animal suffering GDV, the findings vary based on the severity of the condition and the stage of shock at the time of presentation[20]. The patient in this case never presented signs of decompensated shock and that might be because IVFT was started as soon as the patient was admitted.

The image obtained by radiography could be considered pathognomonic and was conclusive to reach diagnosis[10,12].

During the surgical procedure, it was noted a clear demarcation between the normal and the abnormal portions on the spleen. With this case report is intended to highlight the rare finding of a localized or

focal congestive lesion in the spleen due to avulsion of blood vessels and gastrosplenic ligament, little references have been found about this. Congestion is understood as a localized increase of the amount of blood in a particular tissue due to poor venous outflow. Thrombosis and splenic torsion are some of the causes of spleen congestion but in this case, the spleen suffered localized splenomegaly and congestion. There is an article written by Dr. Bichard in 2016 that reported a dog suffering from GDV presented thrombosis of part of the spleen, and splenectomy was performed[6].

Incisional gastropexy was the chosen technique because is an efficient and fast technique with low complication rate (around 17%)[1].

The median hospitalisation period of patients operated of GDV is around 3 nights according to recent studies[18]. The patient stayed in hospital 4 days since admit.

Case reflection

This patient did fit the signalment for GDV, prompted further investigations. A 7 years old (mid to old age), German Shepherd Crossbred Dog (large breed dog), not underweight but on the lean side with a 4/9 body score. The consultation and the admit for hospitalisation were in the afternoon, sampling and placing IV were prioritized over radiography. A fast point-of-care ultrasound revealed no mayor concerns at this point and no signs of GDV. It was the morning after admission when after taking the radiographies GDV was diagnosed.

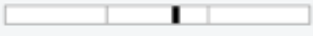
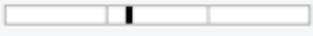
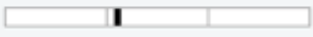
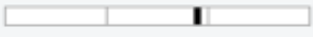
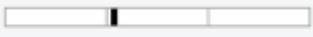
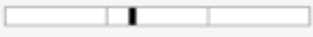
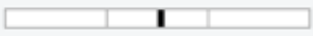
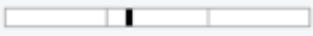
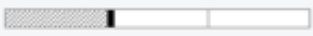
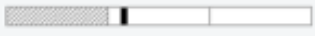
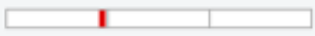
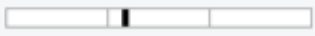
Passing an orogastric tube and removing the rest of the liquid that was present in the stomach at the time of surgery would have been interesting in order to prevent the complications of post operatively gastric dilation. Another option that could potentially reduce the hospitalisation time would have been to place an esophagostomy tube during the GA or even a nasogastric tube to avoid further sedation.

After draining all fluid and gas from stomach metoclopramide CRI was started as it has been proven that in dogs with evidence of postoperative ileus (identified normally by diagnostic imaging) metoclopramide is indicated, being the first-line prokinetic agent used in dogs with GDV[7]. Starting metoclopramide CRI after the procedure could have reduce hospitalisation time in this case.

Partial splenectomy was preferred over complete splenectomy because would preserve splenic function as only a focal injury was present on the head of the spleen. This procedure was also performed in order to avoid the risk of splenic infarction, abscessation, rupture and/or haemorrhage if left in its place injured.

Appendix 1: Haematology above and biochemistry below

TEST	RESULT	REFERENCE VALUE	
RBC	6.96	5.65 - 8.87 x10^12/L	
Haematocrit	0.407	0.373 - 0.617 L/L	
Haemoglobin	144	131 - 205 g/L	
MCV	**58.5**	**61.6 - 73.5 fL**	L
MCH	**20.7**	**21.2 - 25.9 pg**	L
MCHC	354	320 - 379 g/L	
RDW	18.2	13.6 - 21.7 %	
% Reticulocyte	0.1	%	
Reticulocytes	**7.0**	**10.0 - 110.0 K/µL**	L
Reticulocyte Haemoglobin	**21.3**	**22.3 - 29.6 pg**	L
WBC	9.24	5.05 - 16.76 x10^9/L	
% Neutrophils	86.1	%	
% Lymphocytes	8.2	%	
% Monocytes	5.6	%	
% Eosinophils	0.0	%	
% Basophils	0.1	%	
Neutrophils	7.95	2.95 - 11.64 x10^9/L	
Lymphocytes	**0.76**	**1.05 - 5.10 x10^9/L**	L
Monocytes	0.52	0.16 - 1.12 x10^9/L	
Eosinophils	**0.00**	**0.06 - 1.23 x10^9/L**	L
Basophils	0.01	0.00 - 0.10 x10^9/L	
Platelets	***46**	**148 - 484 x10^9/L**	L
PDW	- --.--	9.1 - 19.4 fL	
MPV	10.8	8.7 - 13.2 fL	
Plateletcrit	**0.05**	**0.14 - 0.46 %**	L

Glucose		6.82	4.11 - 7.95 mmol/L	
Creatinine		92	44 - 159 µmol/L	
Urea		3.9	2.5 - 9.6 mmol/L	
BUN: Creatinine Ratio		11		
Phosphorus		1.23	0.81 - 2.20 mmol/L	
Calcium		2.06	1.98 - 3.00 mmol/L	
Sodium	157	159	144 - 160 mmol/L	
Potassium	4.0	3.6	3.5 - 5.8 mmol/L	
Na: K Ratio	39	44		
Chloride	117	113	109 - 122 mmol/L	
Total Protein		59	52 - 82 g/L	
Albumin		28	23 - 40 g/L	
Globulin		31	25 - 45 g/L	
Albumin: Globulin Ratio		0.9		
ALT		73	10 - 125 U/L	
ALP		60	23 - 212 U/L	
GGT		0	0 - 11 U/L	
Bilirubin - Total		<2	0 - 15 µmol/L	
Cholesterol		4.52	2.84 - 8.26 mmol/L	
Amylase		**495**	500 - 1,500 U/L	
Lipase		451	200 - 1,800 U/L	
Osmolality		313	mmol/kg	
Lactate	0.97		0.50 - 2.50 mmol/L	

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