



Ultrasound Cases - Gastrointestinal

Wendy Blount,
DVM



Mandy

Sig: 14 year old SF dachshund

CC: not eating well, vomits daily, getting worse gradually over 2 weeks

- has lost 2 pounds over 5 months
- Eating dirt for 2 months
- 3-4 episodes of vomiting and diarrhea over the past year, one with fever, all responded to antibiotic therapy

Exam: does not allow deep abdominal palpation, she's a biter



Mandy

MDB:

- **CBC** – neutrophilia 18,000/ul, PCV 25%
- **Panel** – albumin 2.1 g/dl
- **lytes, UA, HW Test, fecal** - NSAF

2nd round of tests:

- **Reticulocytes** – 488,400/ul
 - Highly regenerative
- **Fecal cytology**
 - No gross melena
 - Many RBC seen on cytology



Mandy

Abdominal rads:





Abdom





Mandy

Abdominal ultrasound:





Mandy

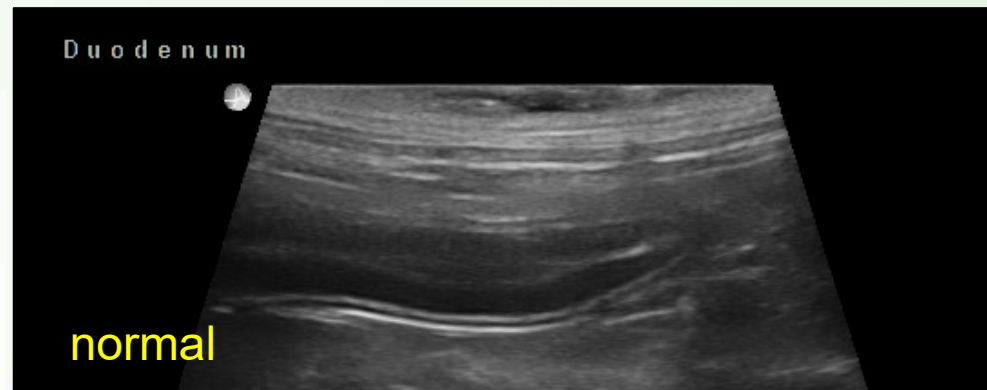
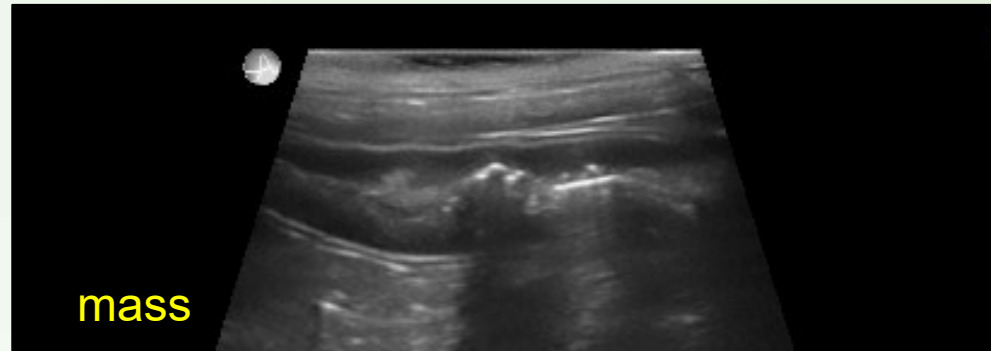
Abdominal ultrasound:





Mandy

Abdominal ultrasound:





Mandy

RadBLUE®

- NSAFL on 3 view met check
 - R lateral, L lateral, VD
- No nodules seen on VetBLUE®

Surgery – anastomosis and resection:

- Mass found at the duodenal flexure
- NSAFL in the remainder of the abdomen



Mandy

Histopathology:

- **GIST** – gastrointestinal stromal tumor
- **Comments**
 - generally slow-growing, and do not metastasize
 - Neoplastic cells do not extend to the specimen borders, and recurrence will likely not be an issue for this dog



Mandy

One year later: recurrence of all symptoms, but sicker than before

Abdominal ultrasound:





Mandy

Abdominal ultrasound:





Mandy

Abdominal ultrasound:





Mandy

Abdominal ultrasound:





Lessons from Mandy

- Ultrasound is the best way to find gastrointestinal masses quickly
 - it can be a first tier test, even before bloodwork
- Every word on the histopath report is not gospel
- Particular conditions in particular animals do not always behave as they usually do
- It's important that we remind clients of the above principles

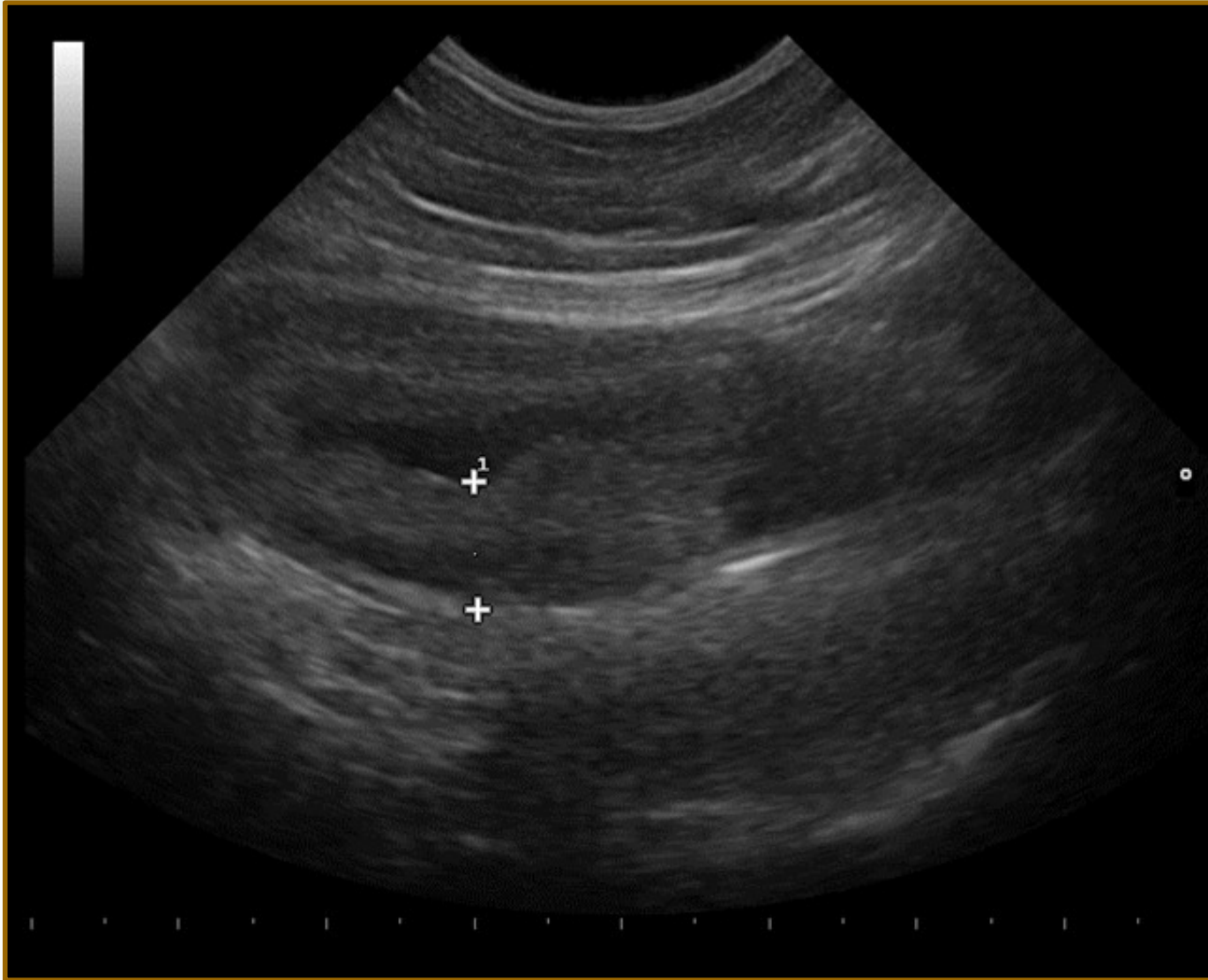
Ultrasound - GI Neoplasia vs. Enteritis or IBD

- Neoplasia more dramatic wall thickening
 - Average 1.5cm or more for neoplasia
 - Inflammatory GI Dz has extensive, symmetrical mild to moderate wall thickening (<1cm) w/ conserved layering
 - Focal wall thickenings and heteroechoic masses may be neoplasia or granulomas
- Neoplasia more complete loss of wall layers
 - **The most specific sonographic sign of neoplasia**
 - Except LSA which can be thickened muscularis only
- IBD can make layers less distinct
 - IBD thickening can be segmental and is *hypomotile*
 - IBD – thickening of any layer except serosa, and may have altered echogenicity

Ultrasound - GI Neoplasia vs. Enteritis or IBD

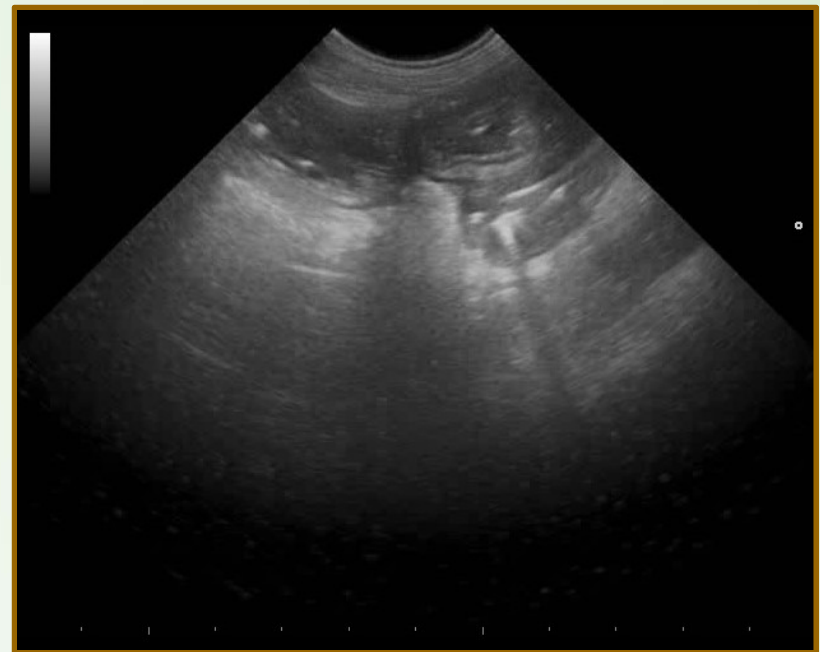
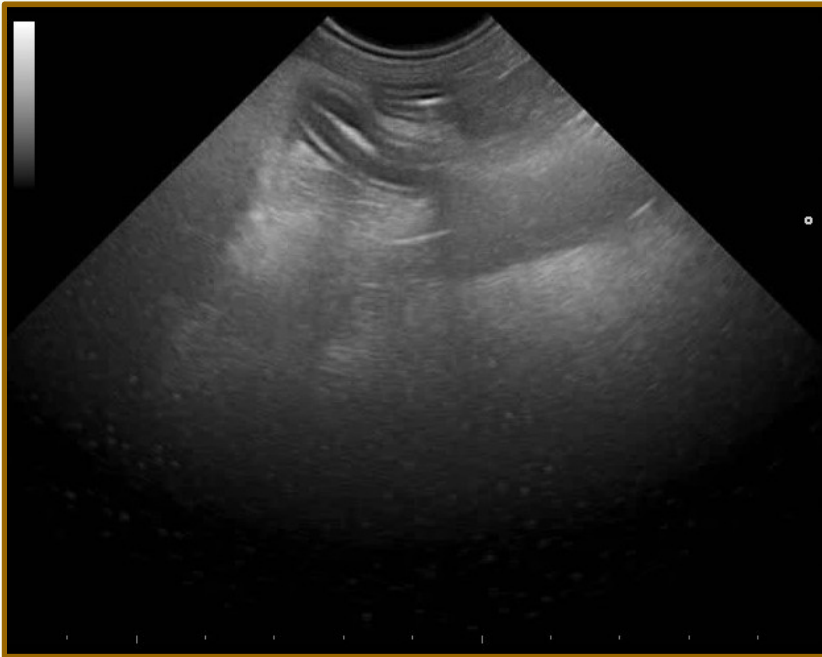
- Neoplasia can be focal, multifocal or diffuse
 - Enteritis more diffuse, except phycomycosis
- Neoplasia can be annular or eccentric
- Neoplasia can be luminal, peritoneal or transmural
 - Leiomyosarcoma may bulge out as an extraluminal mass
- Large masses (>3cm) may have central hypoechoic necrosis
- Pithiosis resembles neoplasia on sonogram

GI Mass



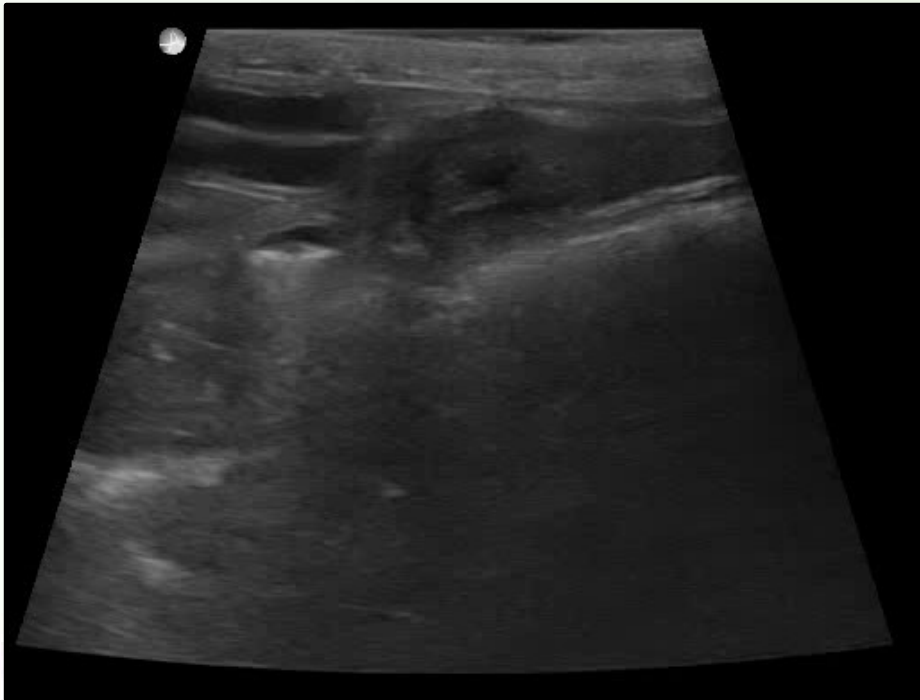
GI Mass

- Acute severe abdominal pain



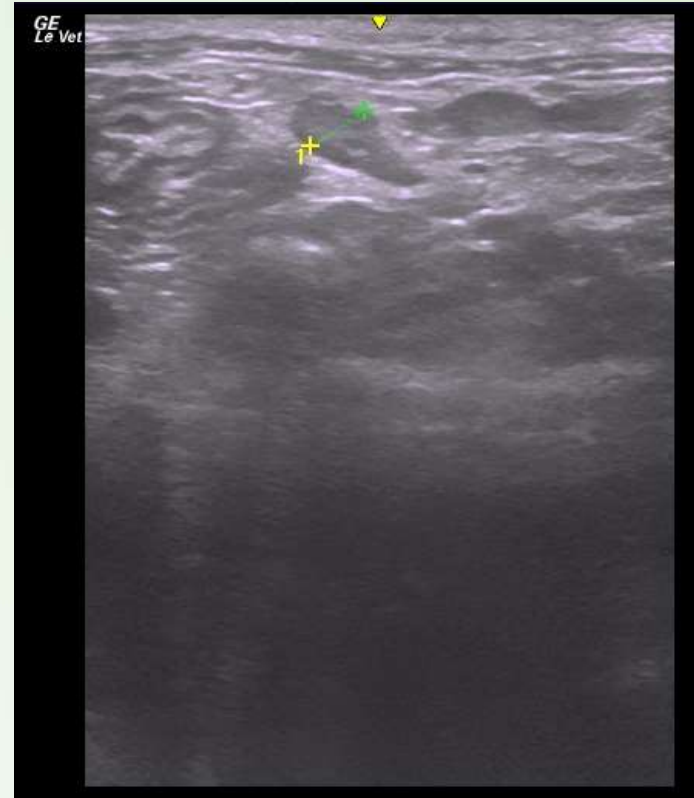
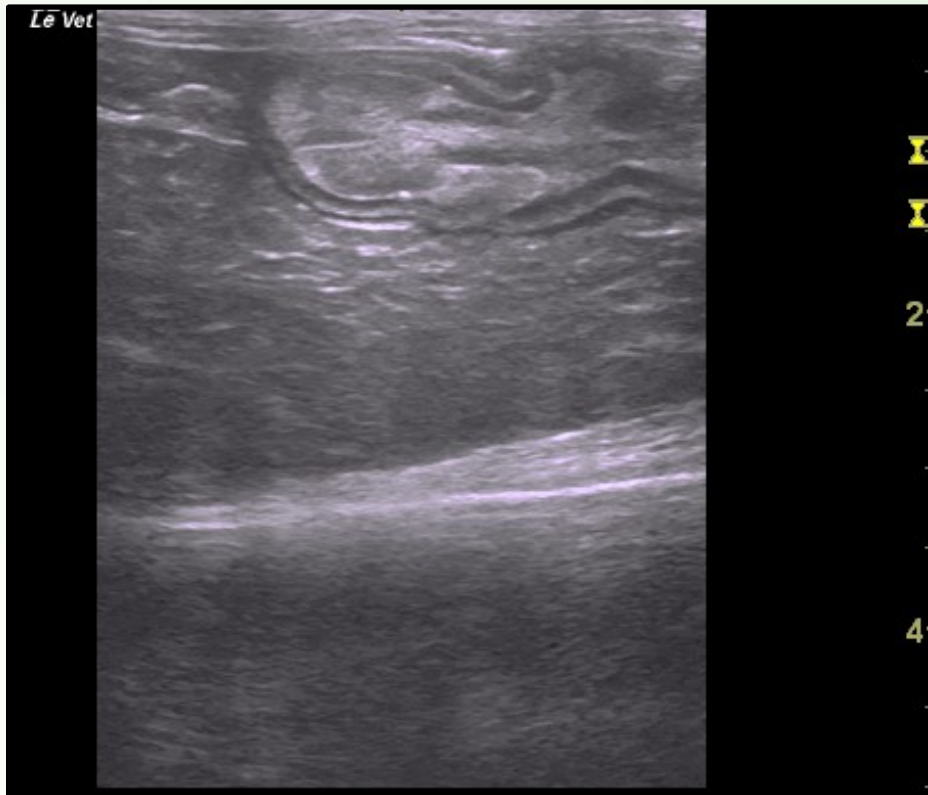
GI Mass

- Chronic Vomiting

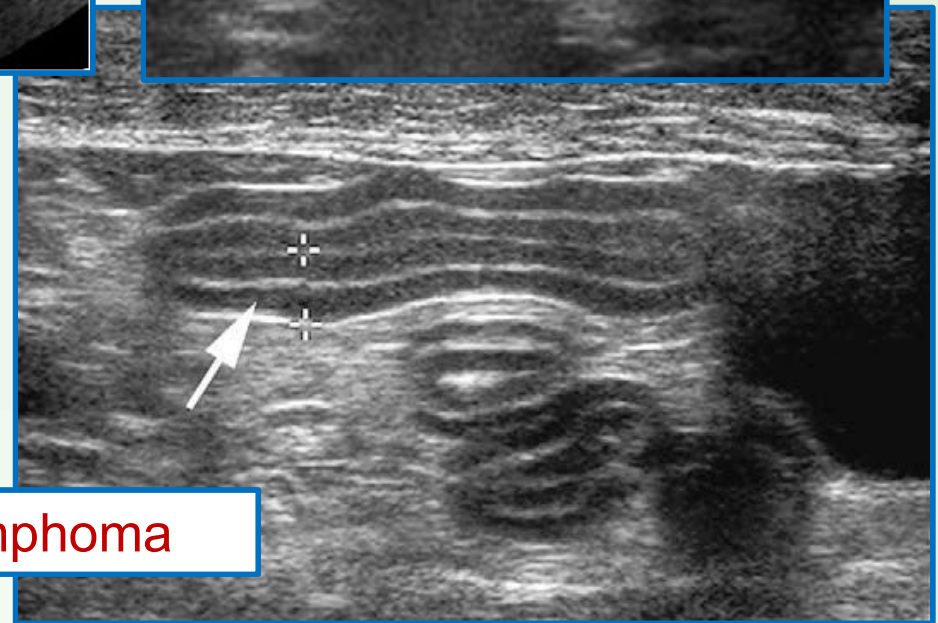
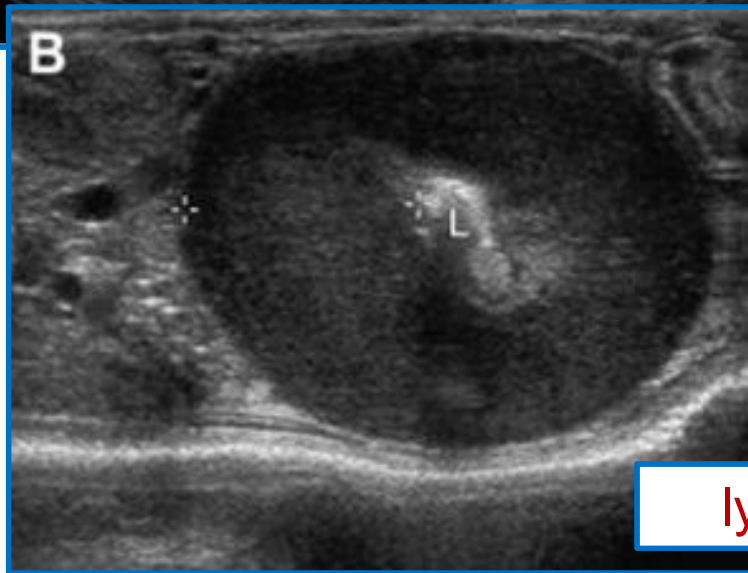
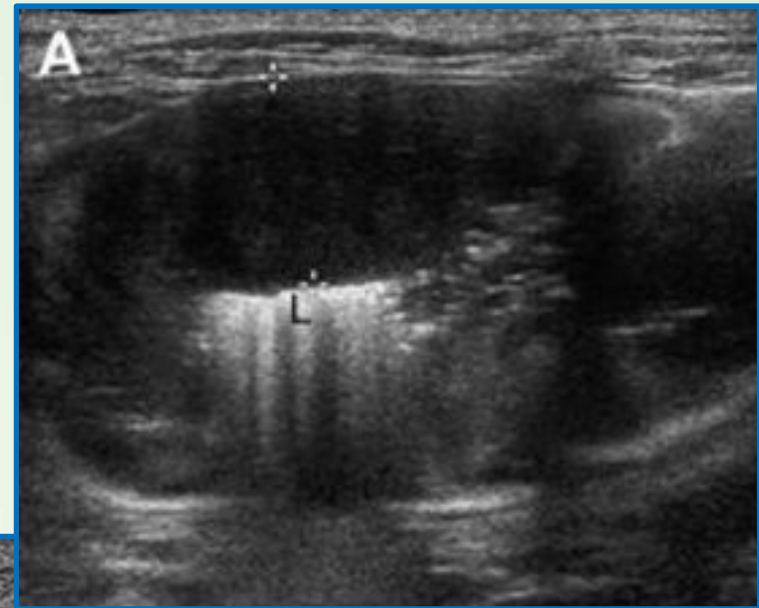
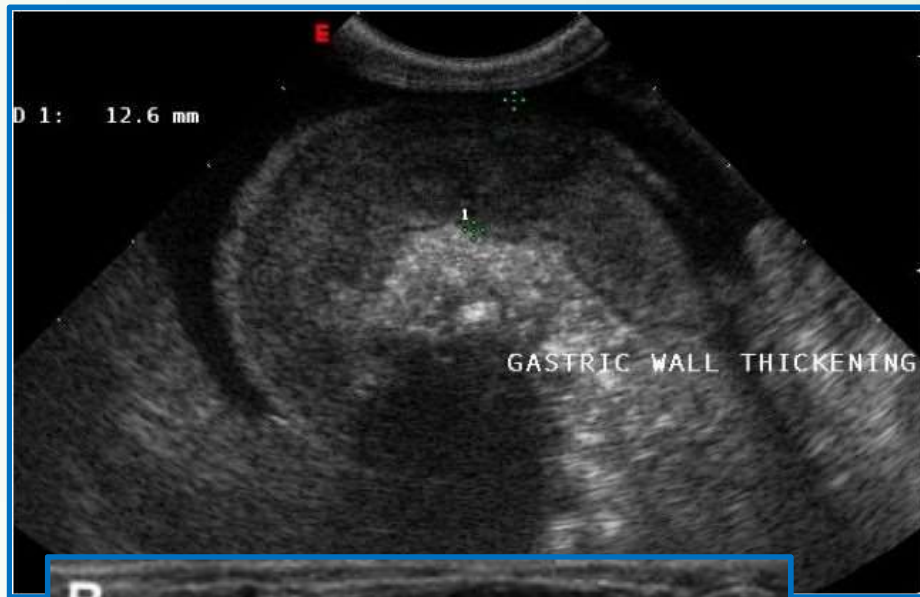


GI Mass

- Anorexia - feline



GI Mass

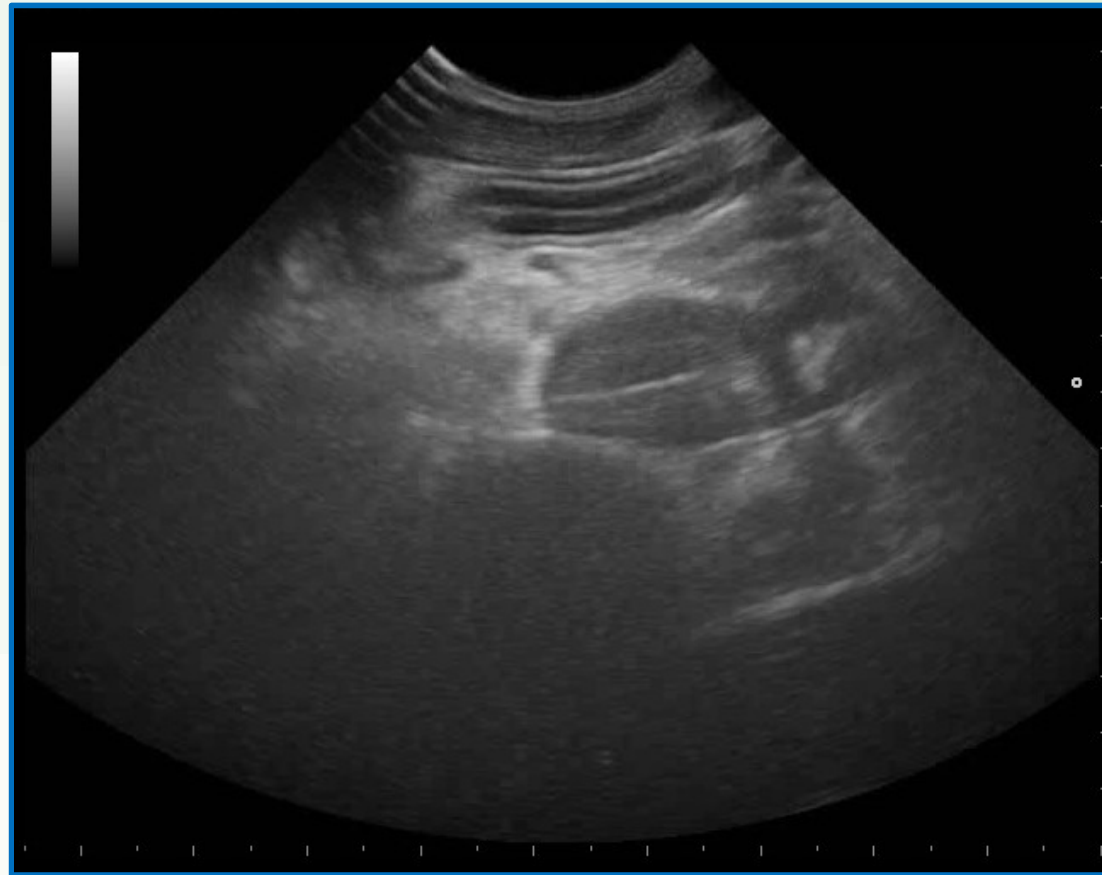


lymphoma

GI Mass - Phycomycosis



GI Mass - Phycomycosis



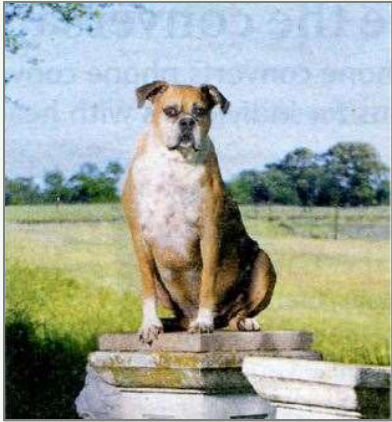
- Roxie Brewster – treated with itraconazole, terbinafine and phyco vaccine (Pan American Labs)

Everything's bigger in Texas, especially...

Bull Dog's Heart



The Story of Bulldog – A Lesson in Forgiveness



Bull Dog

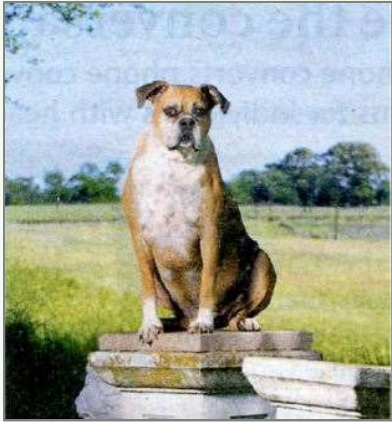
Sig: 10+ year old CM Boxer-Bulldog

CC: has been sick for about 10 days

- Started with gagging
- Progressed to vomiting 10-12x/day
- Cerenia[®] reduced vomiting to 5-6x/day
- Shivering last night
- Not eating now, drinking OK
- Bloodwork 2 weeks ago normal

Exam:

- 5-7% dehydrated
- Abdomen difficult to palpate in this heavy large dog – no discomfort noted



Bull Dog

MDB:

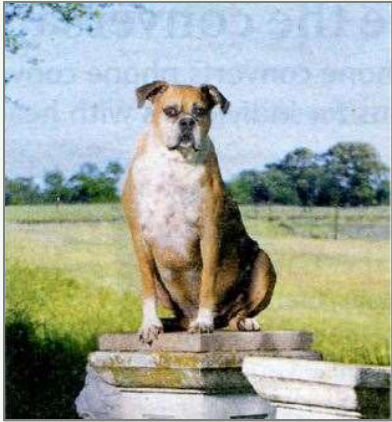
- **CBC** – Neut 1900/mcL
- **Panel** – BUN 28
- **lytes, UA, HW Test, fecal** - NSAF

Supportive Treatment:

- Bolus 10ml/lb LRS, then 2x maint
- Ampicillin + enrofloxacin IV

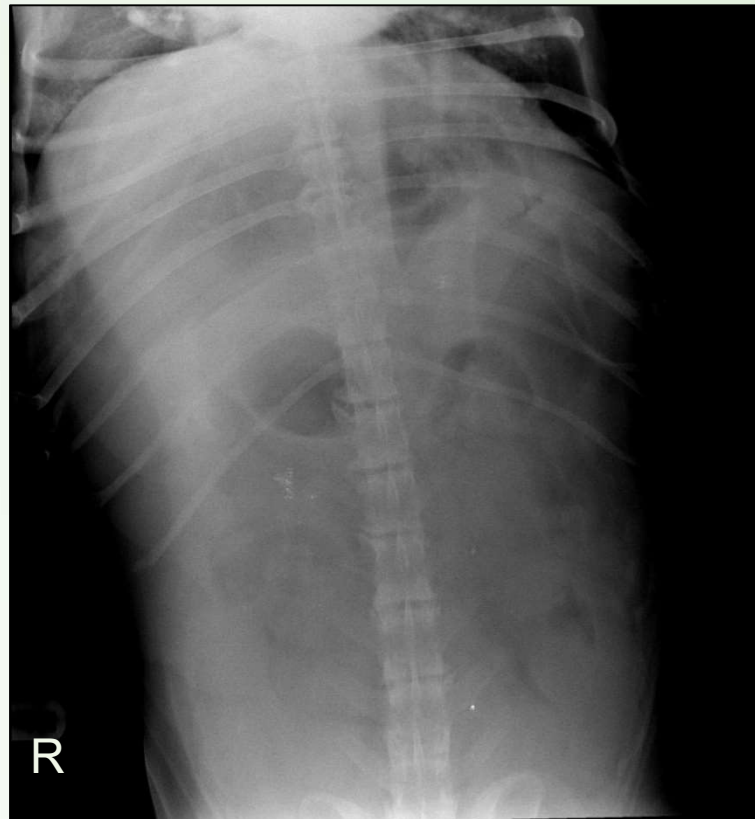
2nd round of tests:

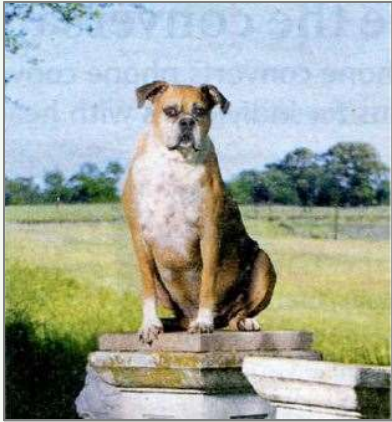
- Abdominal radiographs
- Ultrasound



Bull Dog

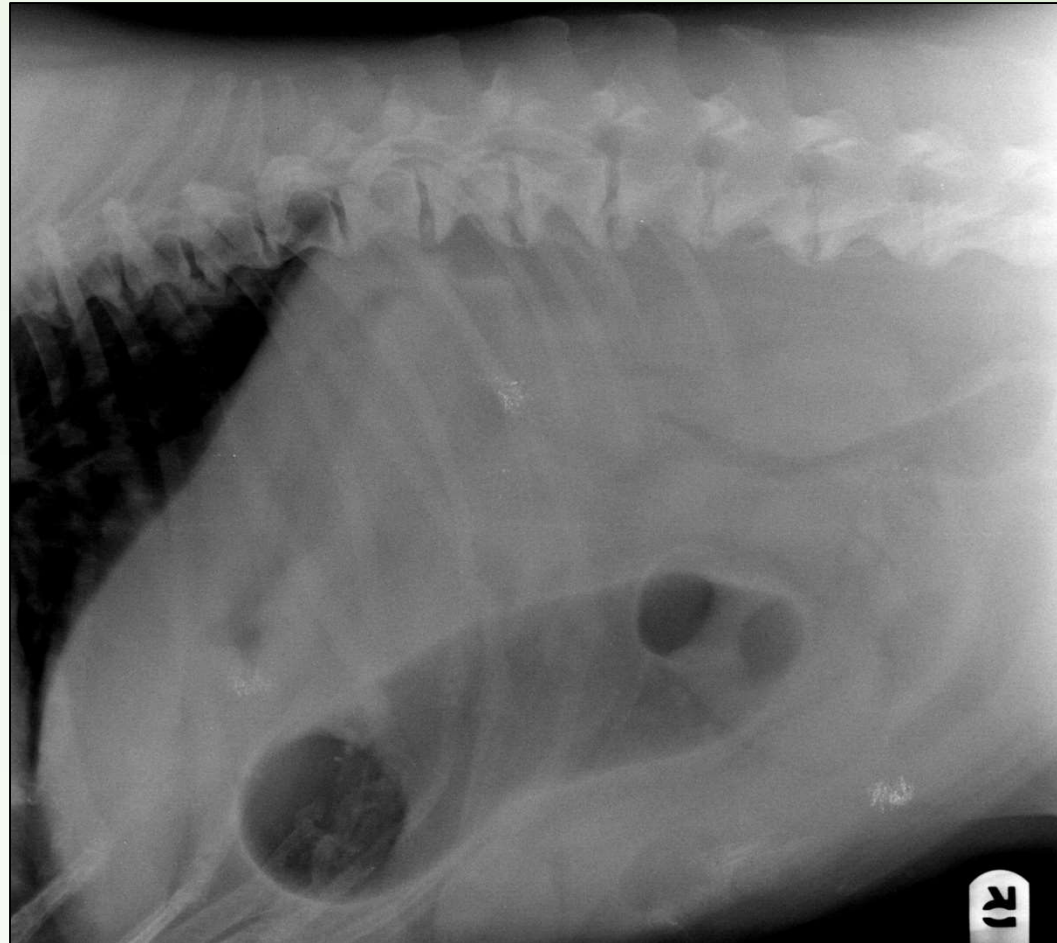
Abdominal rads:

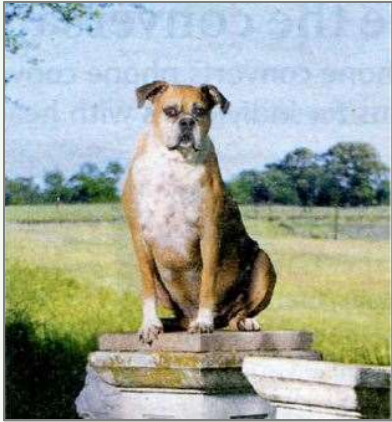




Bull Dog

Abdominal rads:



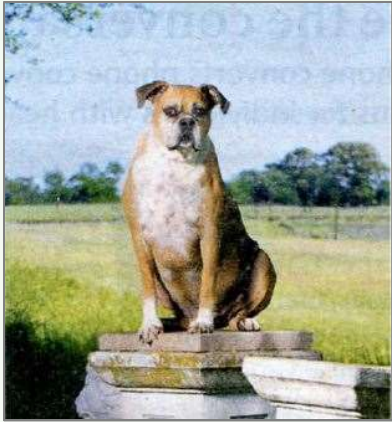


Bull Dog

Abdominal Ultrasound:

Pylorus
Muscularis
5-6mm

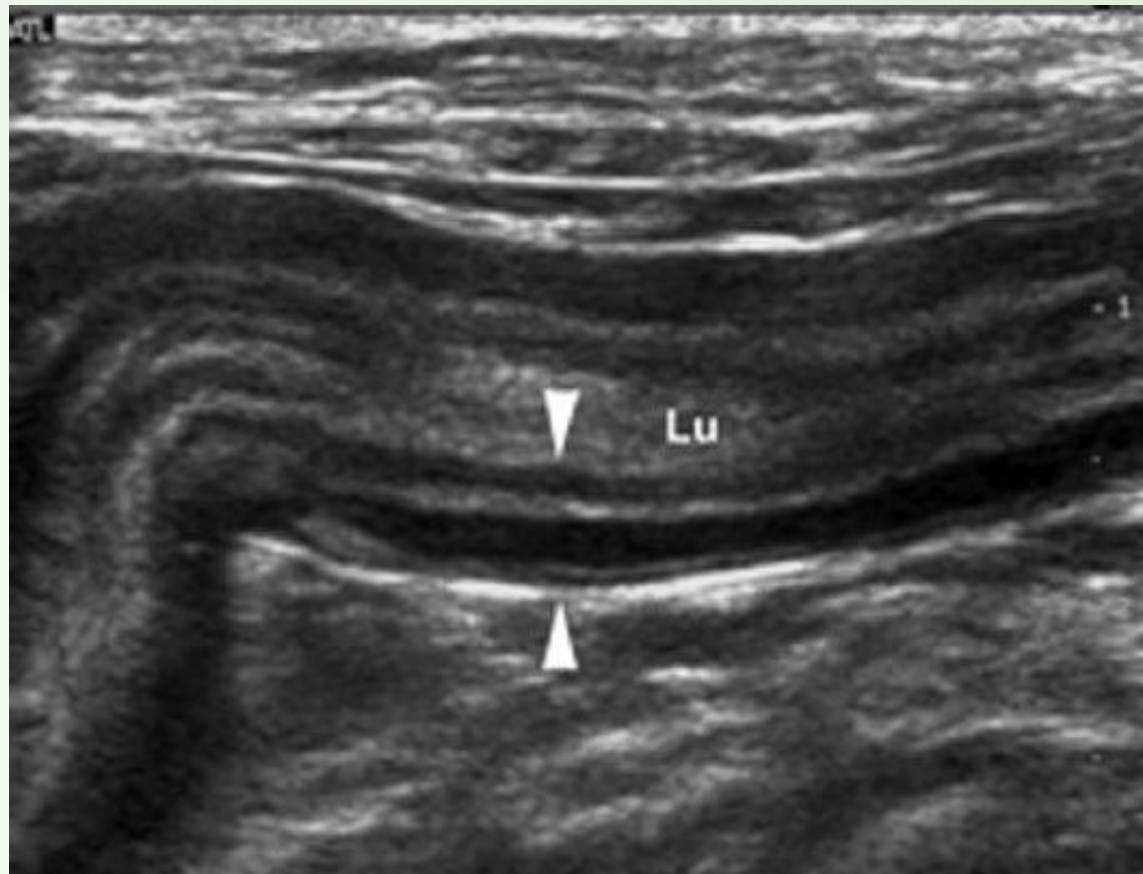


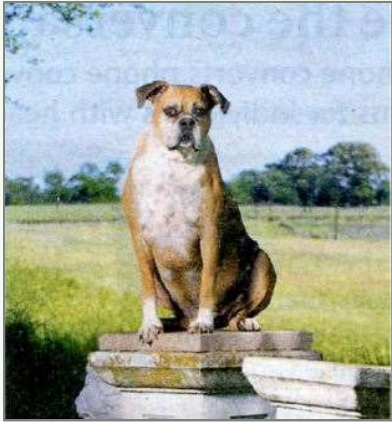


Bull Dog

Abdominal Ultrasound:

Jejunum
Muscularis
6-7mm

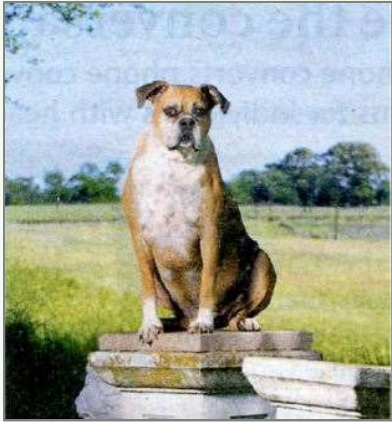




Bull Dog

Abdominal Ultrasound:

- No free fluid in the abdomen
- Multiple areas of distended, fluid filled bowel in the jejunum/ileum
- Multiple focal areas of thickening of the muscularis
- Cranial abdomen difficult to interrogate, due to gas in the gut
- No foreign body found



Bull Dog

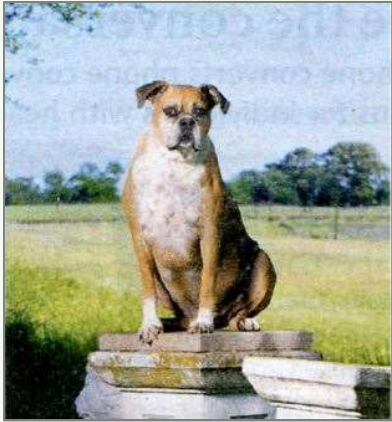
Contrast Series: Why??

- Dog needed to be stabilized for surgery
- No free fluid in the abdomen – perforation unlikely
- Might as well get more info while we wait

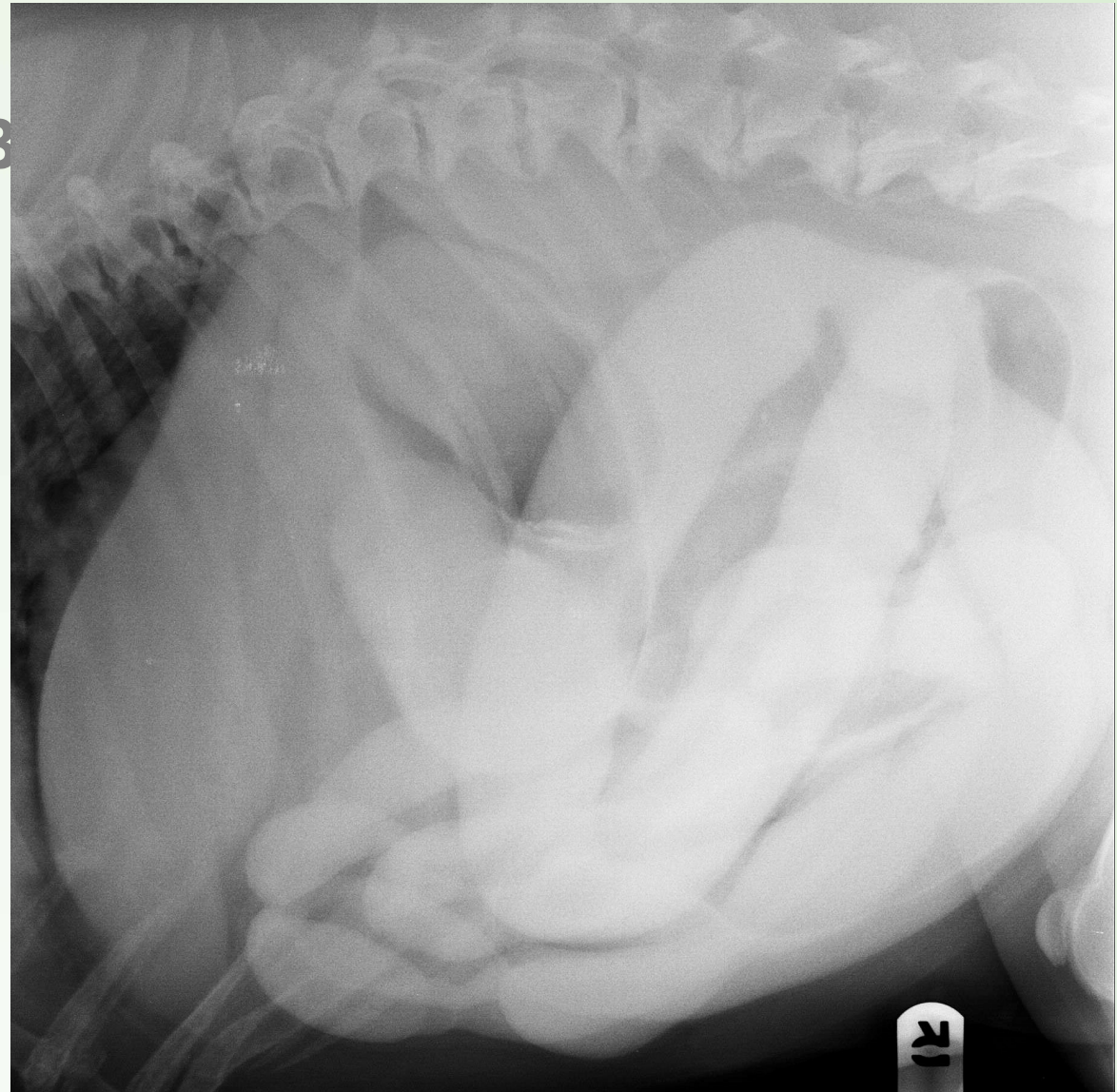
Why gastrografin??

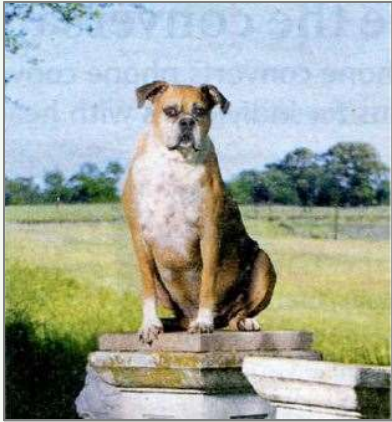
- **No interference with ultrasound**

Bull Dog



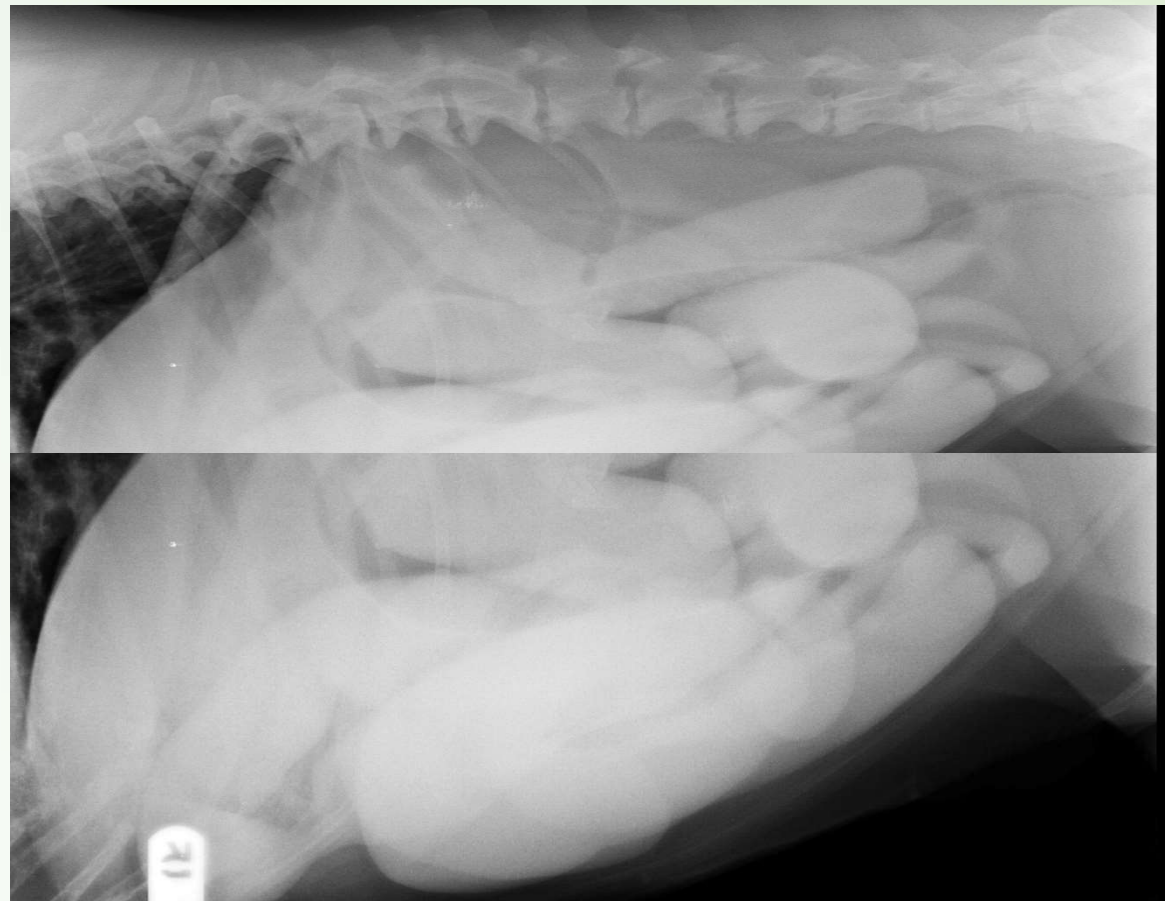
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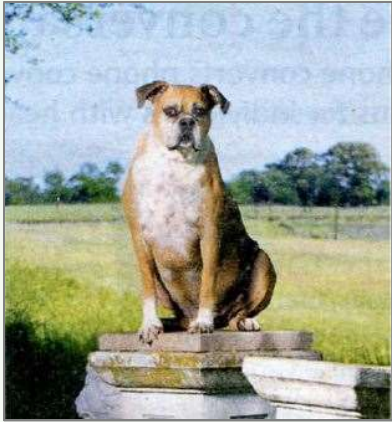


Bull Dog

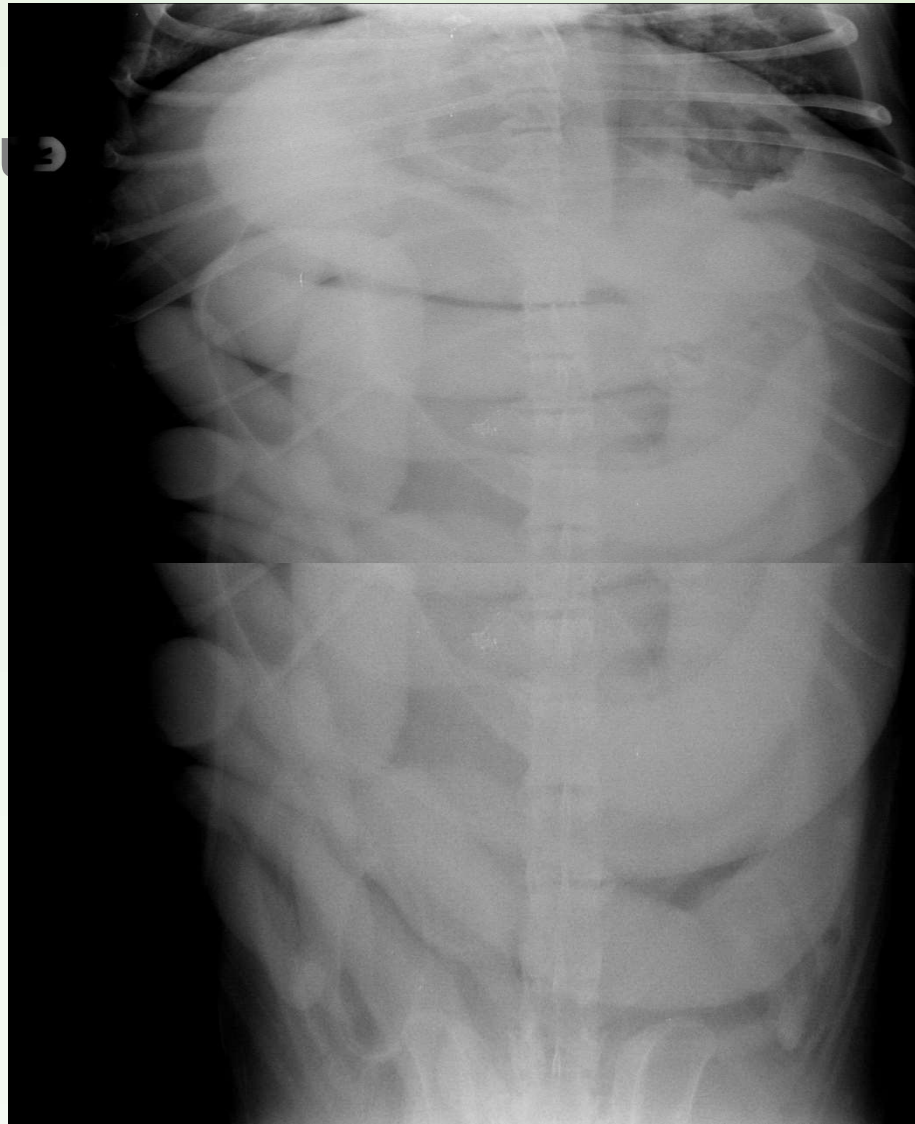
Barium Series:

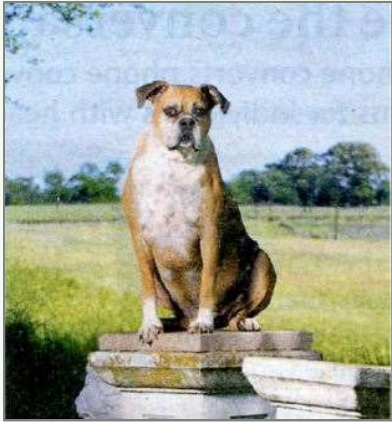


Bull Dog



Barium





Bull Dog

Diagnostic Surgery:

- Segmental ileus throughout the small intestine
- No foreign body found
- Histopathology Dx – multifocal muscularis hypertrophy

Bull Dog was euthanatized due to poor prognosis and poor quality of life

Lessons from Bull Dog:

- Expect to arrive at diagnoses that you didn't know existed, and may not understand ([article on pseudo-obstruction](#))
- Some of us live and learn; Some of us just live.



McDuff

Sig: 16 year old CM Scottie

CC: not eating well for past 4-5 months, getting worse gradually

- has lost 5 pounds over 5 months
- Has vomited once weekly over the past month, and has become lethargic

Exam: thin body condition, QAR



McDuff

MDB:

- **CBC – NSAF**
- **Panel – NSAF**
- **lytes, UA, HW Test, fecal - NSAF**

2nd round of tests:

- Practice has a nice ultrasound, but does not use it much for small animals
- Abdominal radiographs
- Barium study



McDuff

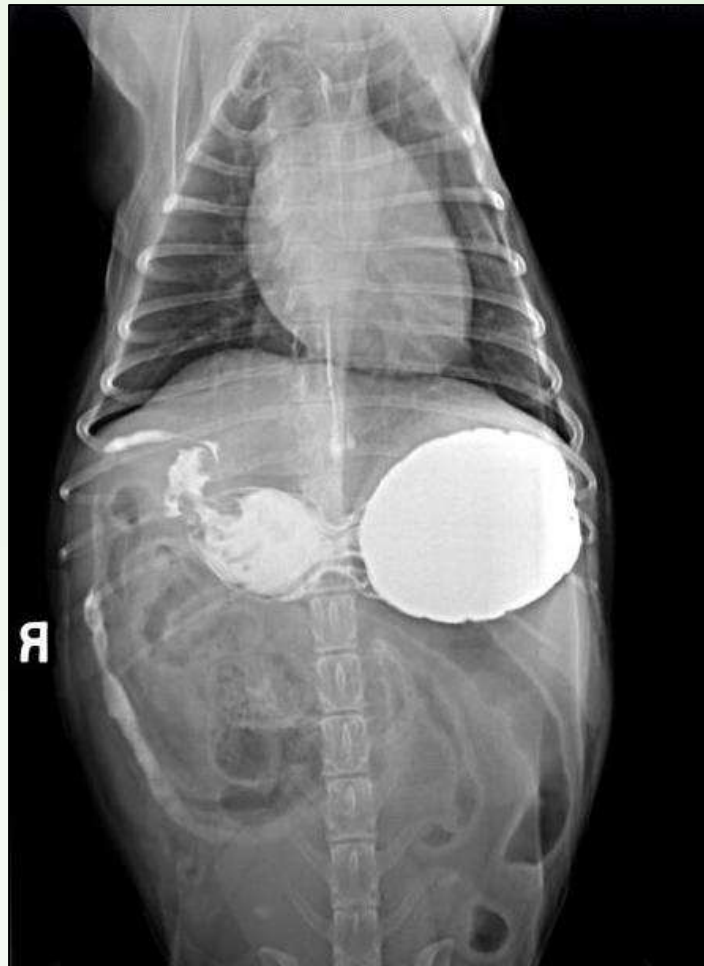
Abdominal rads:





McDuff

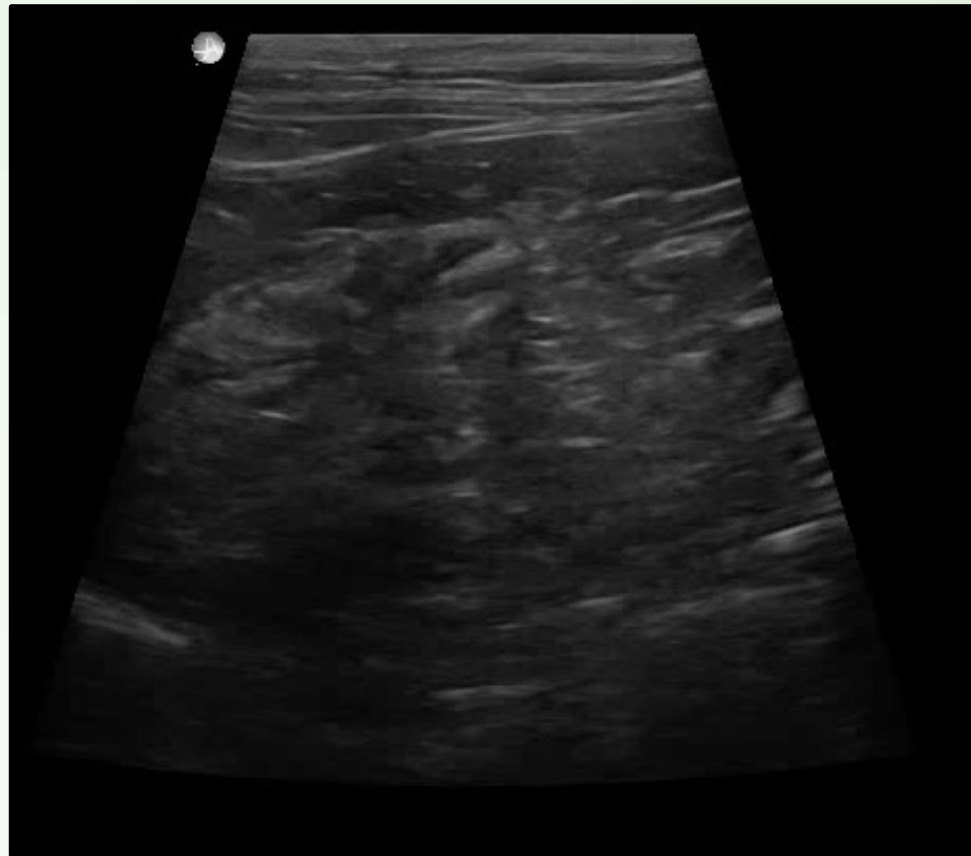
Abdominal rads:





McDuff

Abdominal Ultrasound:





McDuff

Abdominal Ultrasound:





McDuff

Mobile ultrasound the next week confirmed gastric mass at the pylorus

Owners elected euthanasia due to slim possibility that surgery would improve quality of life

Adenocarcinoma confirmed on necropsy

Gastric Adenocarcinoma

- Causes “pseudolayering”
 - alternating hypoechoic and hyperechoic layers in the thickened wall
 - do not correspond to actual histologic wall anatomy
- Most often found in the pylorus
- More likely to produce mixed echogenicity than the other GI neoplasias
- Scirrhous adenocarcinoma can appear as a fibrous stricture rather than a mass

Hypertrophic Pyloric Gastropathy

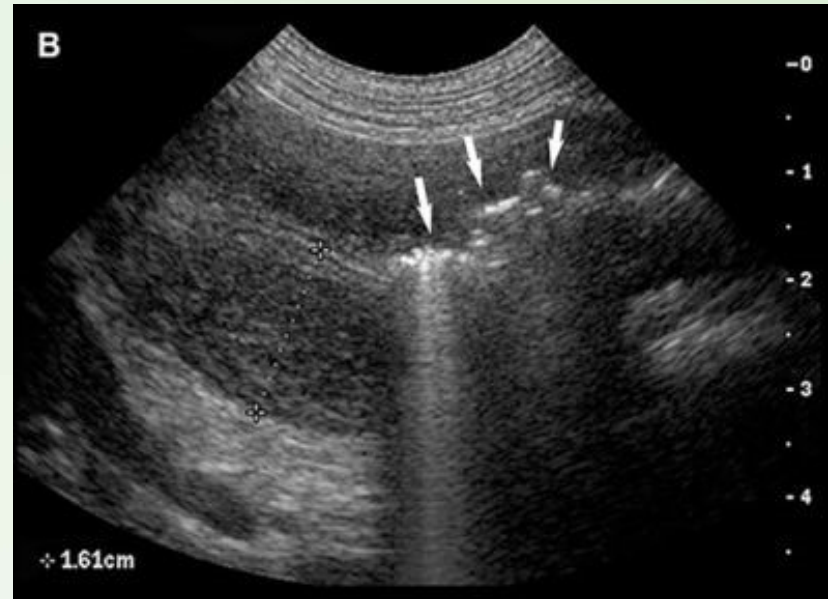


Hypertrophic Pyloric Gastropathy

- Young dogs with profuse vomiting and weight loss
 - Similar presentation to *Physaloptera* infection
- Gastric Mucosa is up to 2x thickened circumferentially
- More often hypoechoic, but can be hyperechoic (m:m >2:1)
- Pylorus is more affected than fundus
- Layering is preserved
- Stomach distended with fluid

Uremic Gastropathy

- All layers of gastric wall and rugae are thickened
- Decreased layer definition
- Fundus & body are more greatly affected
- Mucosa may be mineralized
 - Thin echoic line at the luminal surface
- Hyperechoic dots may also indicate mural gas, associated with more severe ulcers





Elvis

Sig: 5 year old Male English Bulldog

Hx: Doc W gets a call from animal control at 5am that there is a rabid dog that needs to be dispatched and sent for testing

- Doc W arrives on the scene to find a dog that is indeed salivating profusely
- He aims his pistol and is ready to shoot when he recognizes Elvis as his patient.
- He captures the dog with a control stick and transports him to the clinic in a carrier
- The dog does not seem to have neurologic deficits, but is vomiting profusely
- Doc W calls the owner and learns that Elvis has been missing for 5 days, since the July 4 picnic



Elvis

Exam – severe pain and projectile vomiting on abdominal palpation

MDB: CBC – neutrophilia 22,320/ul

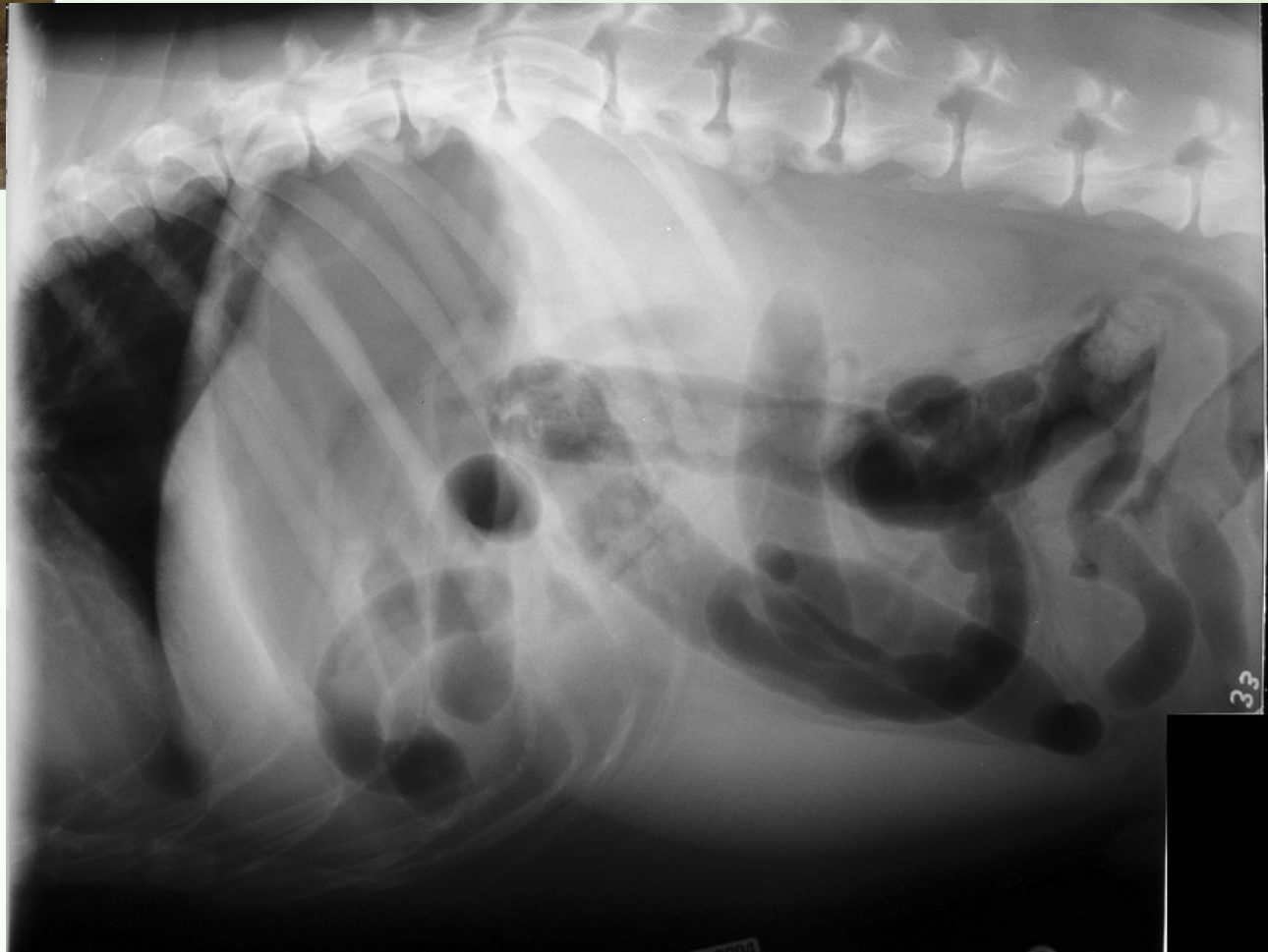
- **Panel, lytes** – NSAF
- **HW Test** – positive
- **Fecal** – negative

Owner want Elvis saved – cost is no object



Elvis

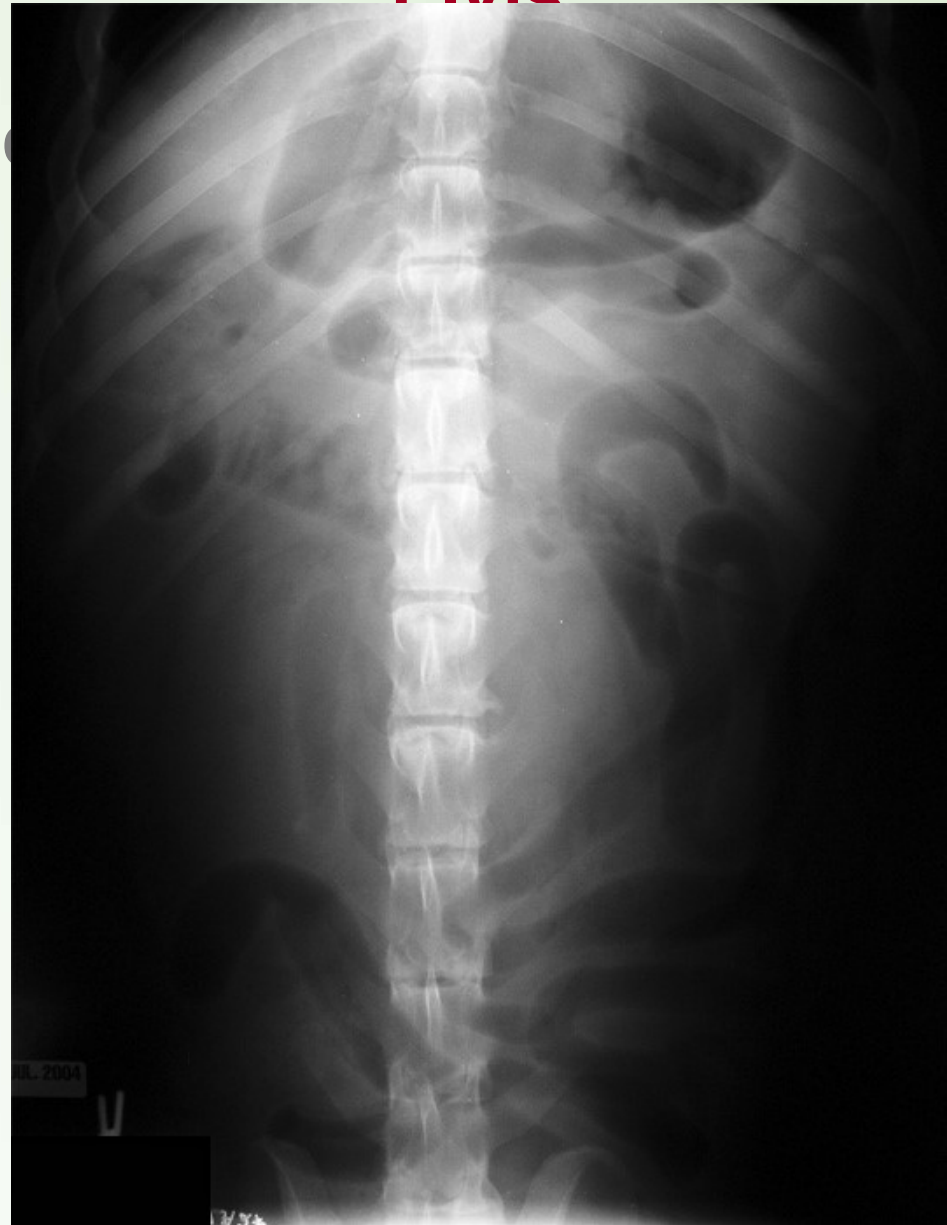
Abdominal Radiographs





Abd

Elvis





Elvis

- Doc W drops Elvis off at my clinic on his lunch hour
- We reach the owner and he indeed wants Elvis saved, at any cost
- He will pay when he can



Elvis

Abdominal Ultrasound

- No free fluid in the abdomen
- No abnormalities in the liver, gall bladder, kidneys, pancreas, or urinary bladder



subjectively large and
hypoechoic, but no
abnormalities noted



Elvis

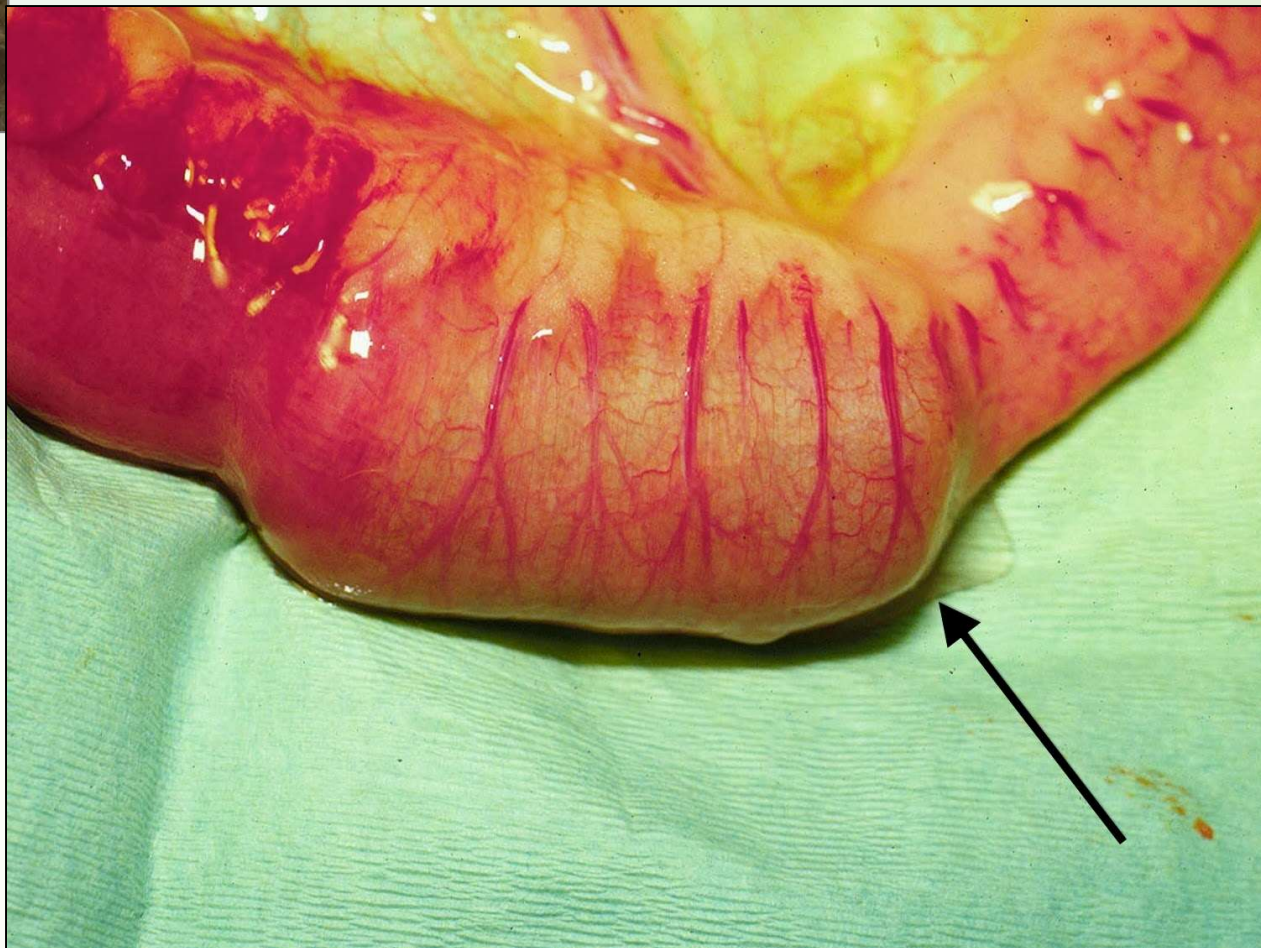
Abdominal Ultrasound

- No free fluid in the abdomen
- No abnormalities in the liver, gall bladder, kidneys, pancreas, or urinary bladder
- Spleen is subjectively large and somewhat hypoechoic, but no significant abnormalities noted
- Gut:
 - Dilated jejunum, fluid and gas filled
 - Foreign object with hyperechoic interface & acoustic shadow
 - Normal gut downstream



Elvis

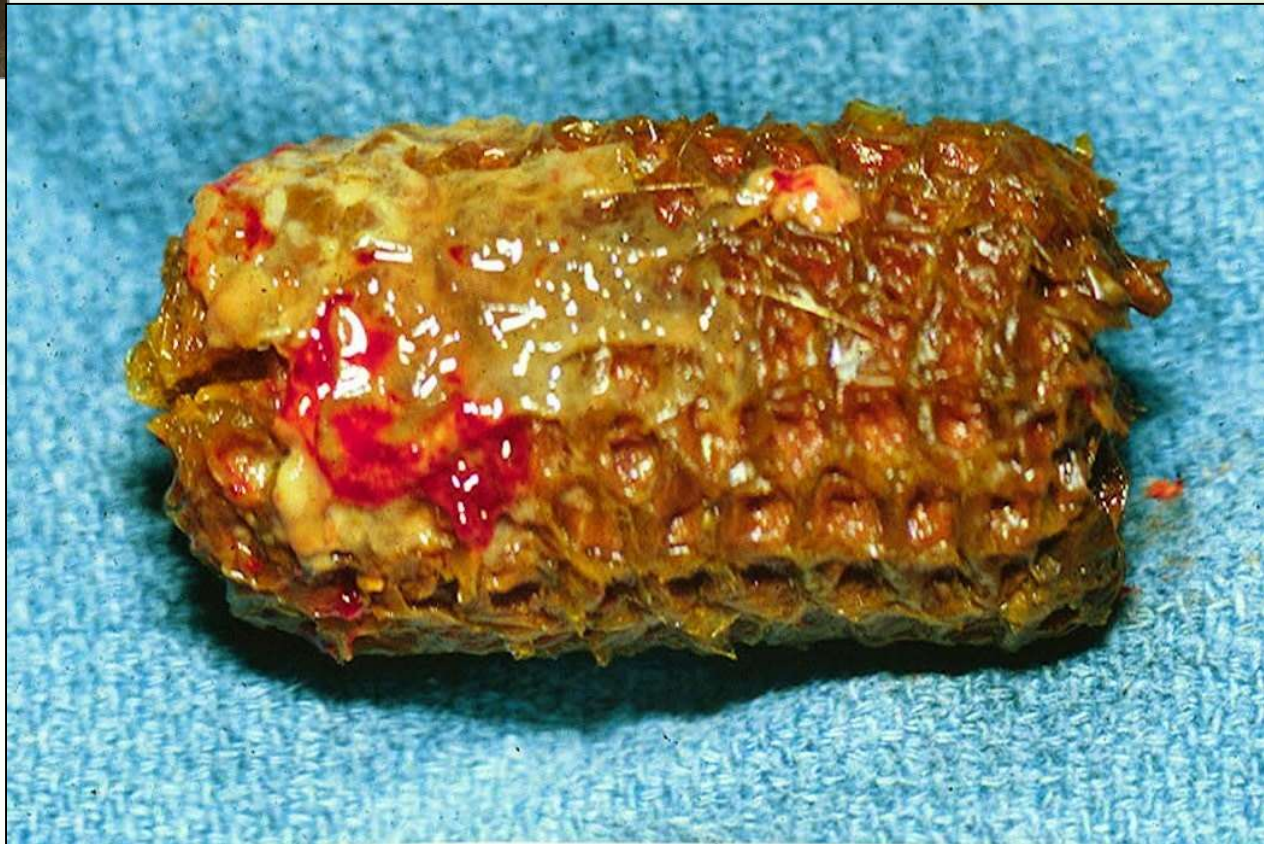
- Exploratory Surgery for obstruction:





Elvis

- Exploratory Surgery for obstruction:





Elvis

- Elvis recovered and went home in 2 days
- One year later, Mr. Elvis Dad had still not made payment on his bill
- The debt was settled by trading for three guns and a bushel of apples

Sebastian



- 9 year old neutered male pit bull
- 1 week ago ataxia and falling, and vocalizing every time he moves, after a dog fight
 - 2 year history of relapsing neck pain
 - Tx prednisone, methocarbamol, Tramadol, cage rest - no response for 4 days
- Sedated for radiographs 4 days ago
 - Cervical & lumbar intervertebral disc calcification
 - vomited large amount of fluid with coffee grounds after sedation
 - Mid abdominal mass on x-rays?

Sebastian



- Albumin 2.1 g/dl (2.2 g/dl low normal)
- SAP 2119 U/L, ALT 1434 U/L, Bili 8.2 mg/dl
- HCT 30.8%

Tx carafate, IV fluids, metronidazole, amoxicillin x 4 days

Referred for **ultrasound – the best test for assessing hepatic and post-hepatic icterus, and to evaluate possible mass**

- Exam
 - Can not walk - Muscle tremors and very jumpy
 - Abdomen tense and difficult to palpate, very large urinary bladder
 - Sclerae injected and icteric – owner says eyes have been red for 30 days

Sebastian



- Neuro Exam
 - Unable to walk, unable to assess postural reflexes and CP
 - Cranial nerves normal
 - Spastic paresis in all 4 limbs (UMN reflexes)
 - Conscious motor activity in all 4 limbs
 - Lower cervical pain
 - Dx - Lower cervical spinal cord disease
- Catheterized bladder and removed 1.5L of orange urine (bilirubin crystals)
- Hx – has been on clomipramine for some time, for anxiety

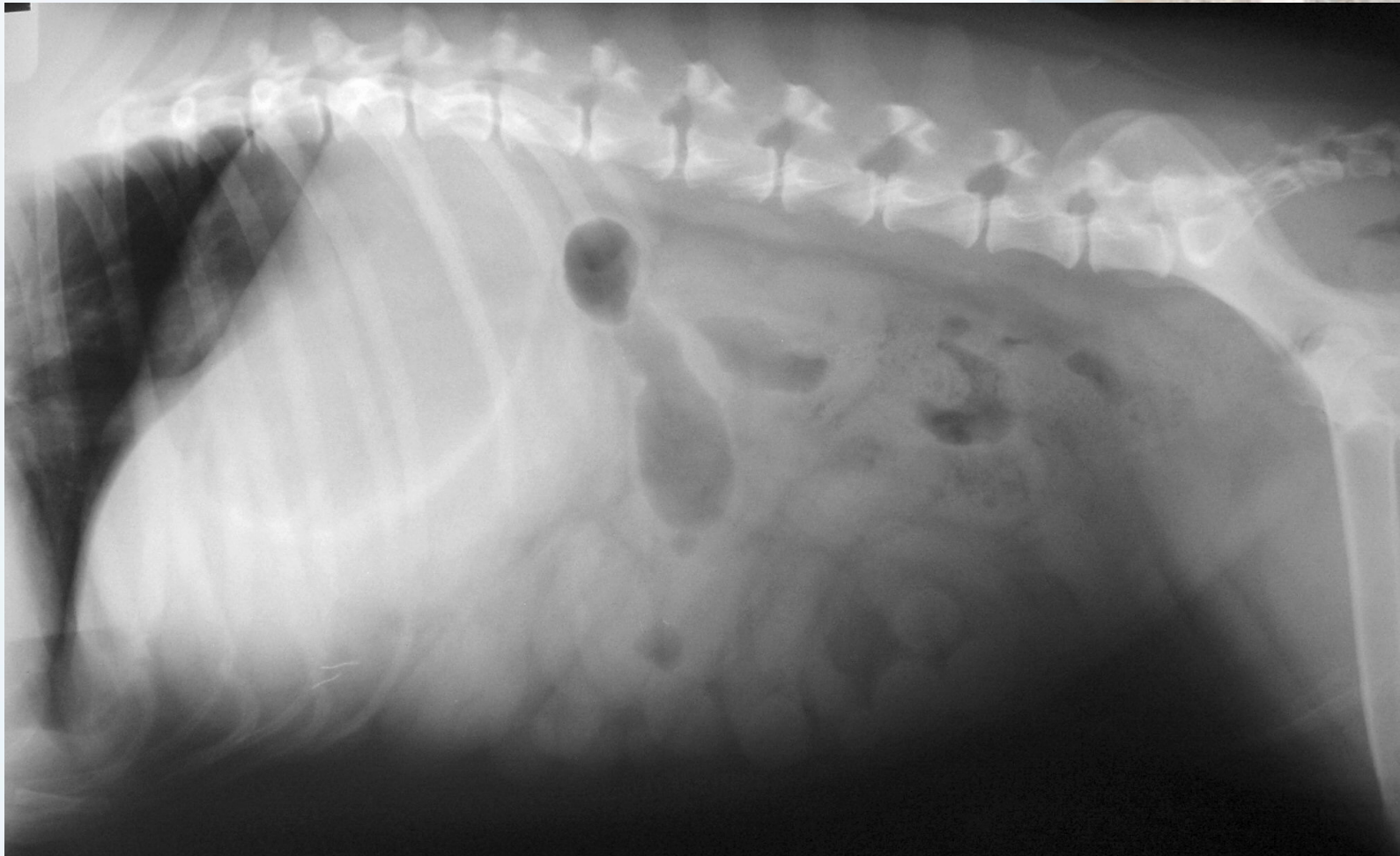
Sebastian



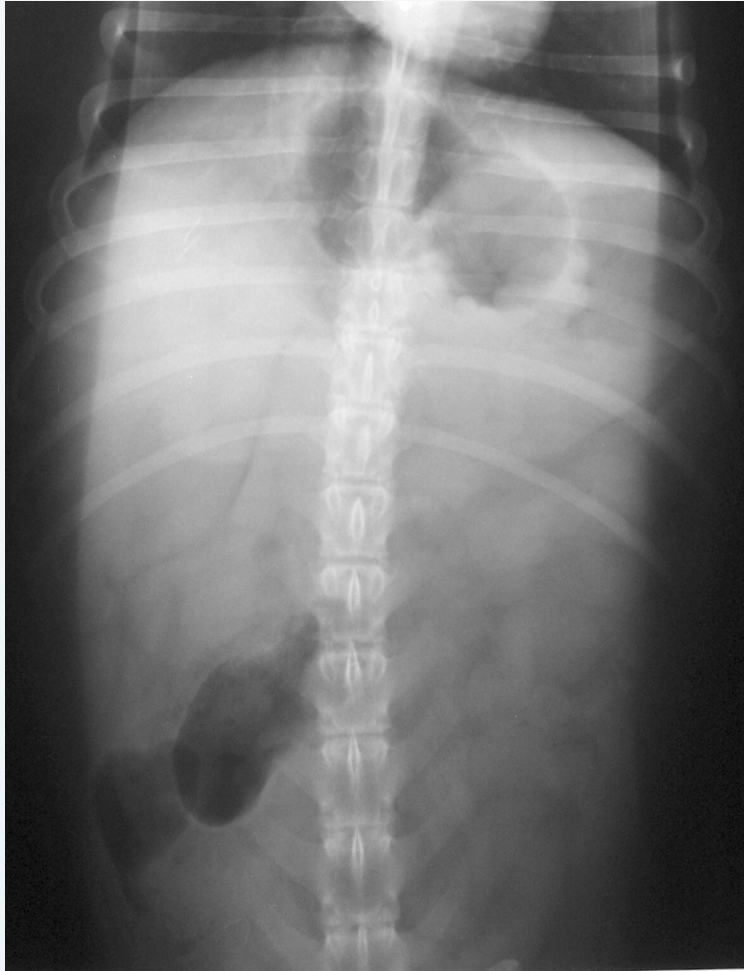
Problem List

1. Cervical myelopathy and tetraparesis
 - Surgery not an option for these owners
2. Icterus – likely hepatic and/or post-hepatic but early GI blood loss hemolysis can not be ruled out
3. Hematemesis – prednisone, liver failure, spinal cord injury
4. Twitching – hepatic encephalopathy, metronidazole toxicity, serotonin syndrome
5. Mid abdominal mass – will assess with ultrasound
6. Mild anemia

Sebastian



Sebastian



Sebastian

Radiographs

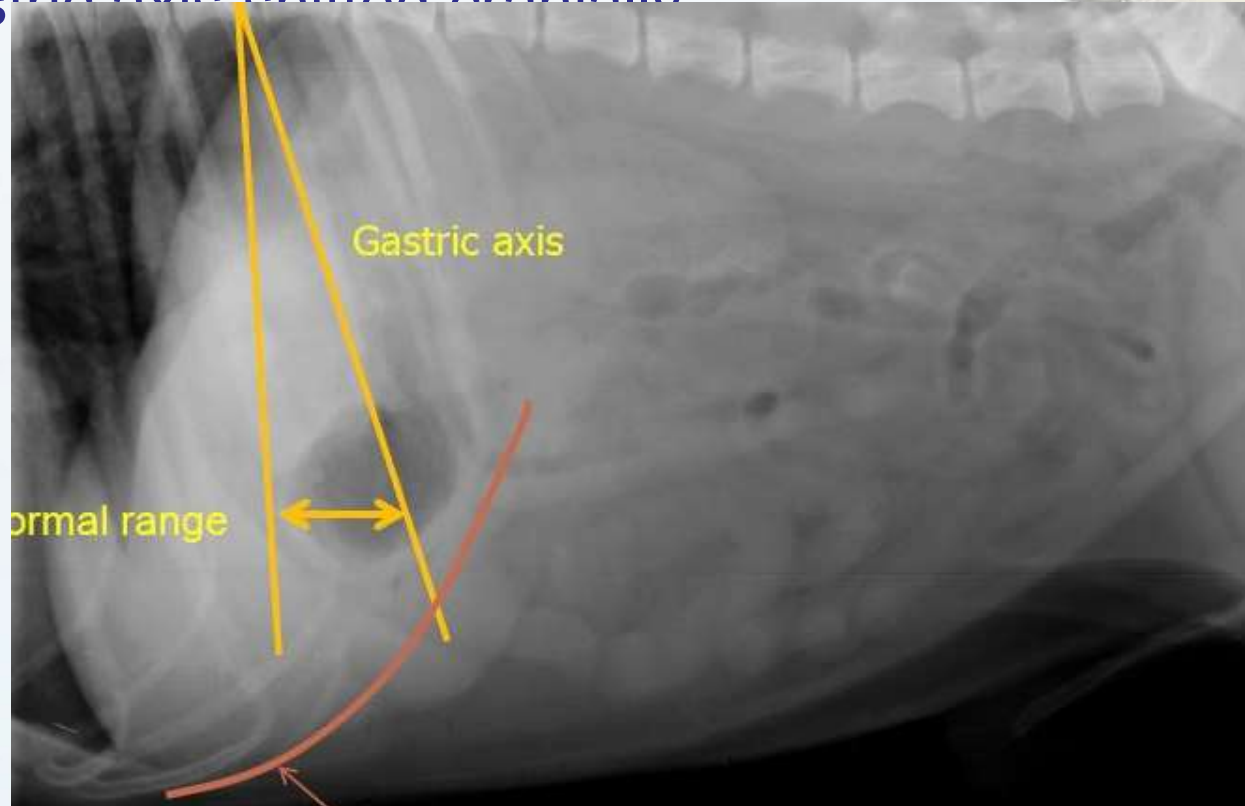
- Large amount of air in the stomach
- Gastric axis shifted cranially



Normal Dog

Radiographs

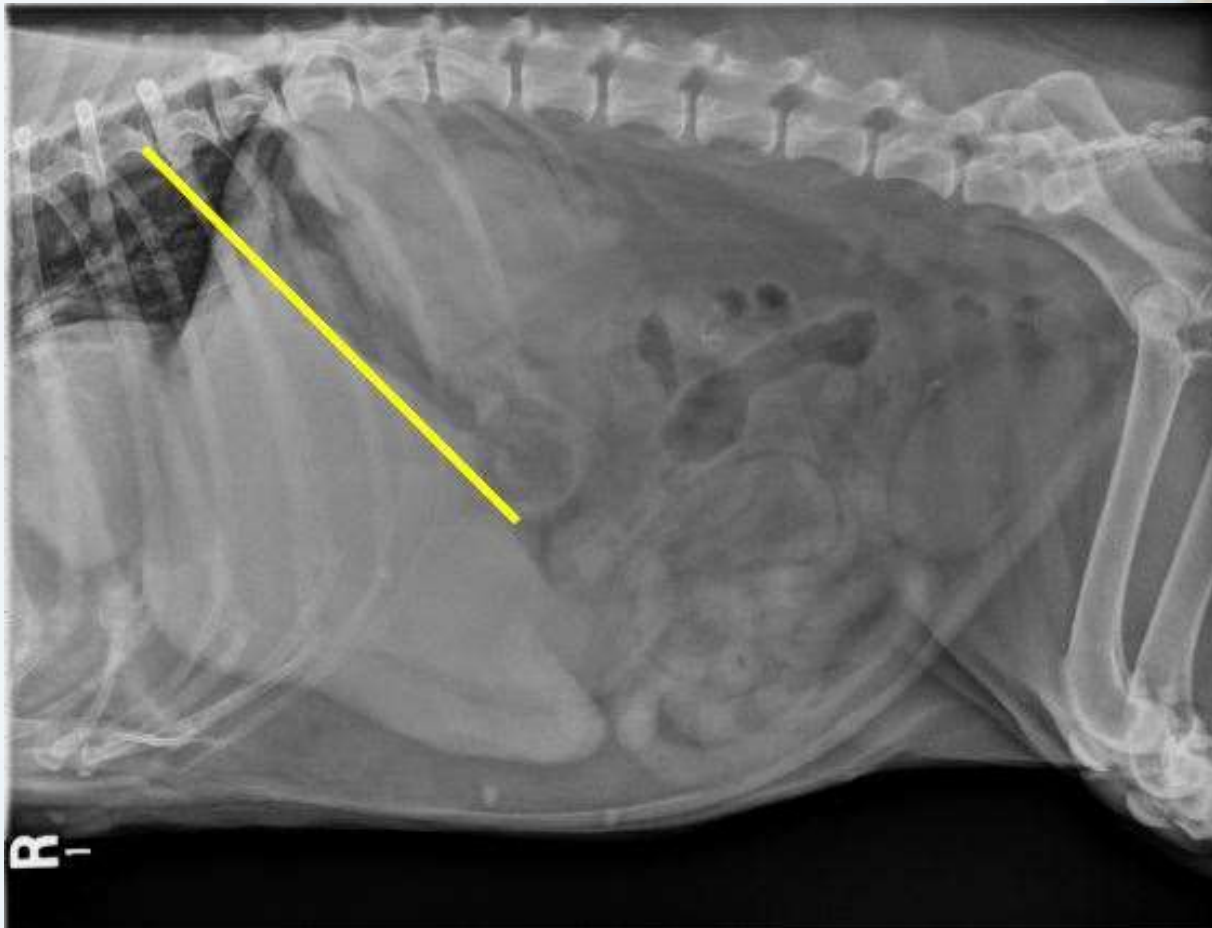
- Large amount of air in the stomach
- Gastric axis shifted cranially



Hepatomegaly

Radiographs

-
-



Sebastian



Radiographs

- Large amount of air in the stomach
- Gastric axis shifted cranially
- Intestines appear distended with fluid
- Cervical and lumbar spondylosis
- Cervical and lumbar mineralized disc material
- Disc material in the cervical spinal foramina
- Dx – microhepatia
- Dx – degenerative disc disease

Sebastian



Abdominal Ultrasound

- Difficult because of the great amount of air in the stomach, due to aerophagia

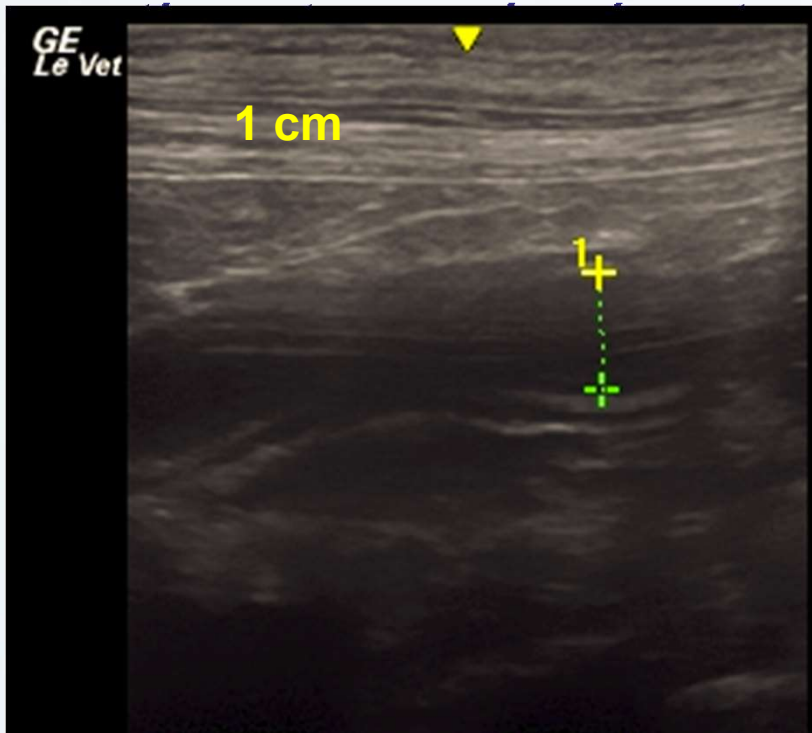


Sebastian



Abdominal Ultrasound

- Difficult because of the great amount of air in



Sebastian



Abdominal Ultrasound

- Difficult because of the great amount of air in the stomach, due to aerophagia
- Small areas of the liver seen, hyperechoic, mottled in echotexture
- Gall bladder not seen
- Many fluid filled loops of bowel

PT, PTT - normal

Sebastian



Plan

- Discontinue prednisone, Tramadol, clomipramine, metronidazole
- Continue Carafate, IV fluids (LRS + 20 mEq/L KCl), ampicillin IV
- add milk thistle, famotidine
- Fast overnight and repeat ultrasound tomorrow
- Repeat CBC, panel, lytes tomorrow
- Send out Lepto titers
- Express bladder or catheterize to empty bladder TID

Sebastian



Day 2

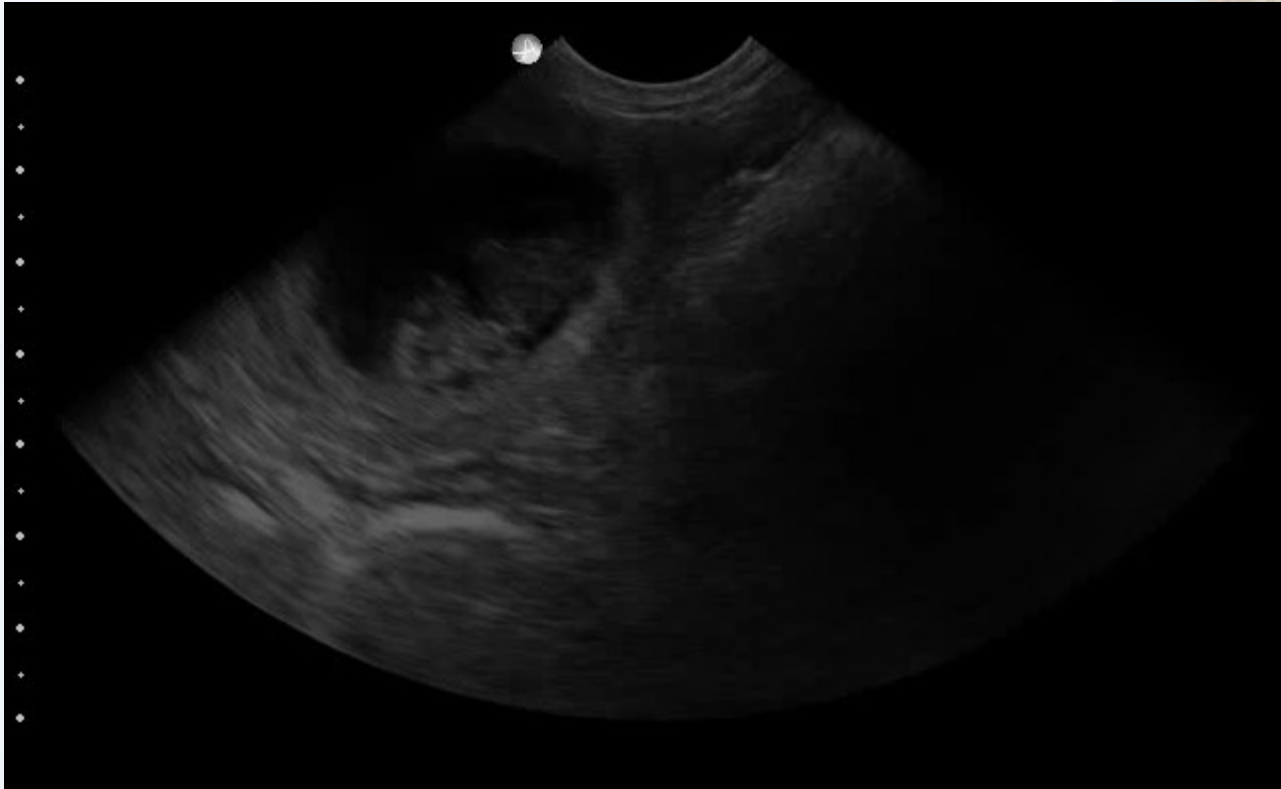
- Ate chicken and drank water yesterday
- Twitching stopped
- Skin appears less icteric, scleral injection improved
- HCT 17.7%, Hb 5.6 g/dl
- Albumin 1.6 g/dl, globulin 2.0 g/dl, Bili 5.4 mg/dl
- Neutrophilia 20K/ul
- No vomiting, no melena
- Urine is golden, not orange
- Eating chicken and drinking

Sebastian



Ultrasound

-
-
-
-



olestasis

Sebastian



Ultrasound

- Liver small, mottled, hyperechoic
- Liver cytology – suppurative hepatitis with cholestasis
- Gall bladder wall thickened - cholecystitis
- No fluid in the abdominal cavity

Plan – add Baytril® & Vitamin K, monitor PCV

Sebastian



Day 3

- Vomited overnight – chicken, melena on thermometer
- HCT 14.9%, Hb 4.6%
- neutrophils 21.7K/ul
- Albumin 1.5 g/dl, globulins 1.9 g/dl
- Lytes normal

Plan

- Whole blood transfusion
- Ate chicken & rice well that night, drinking water

Sebastian



Day 4

- Not feeling well, passed melena, fever 103.4F
- Will not eat, licked lips when food offered
- Abdominal US



Sebastian



Day 4

- Not feeling well, passed melena, fever 103.4F
- Will not eat, licked lips when food offered
- Abdominal US – still no evidence of perforation, but deep ulcer seen in the duodenum
- PCV 25%, albumin 1.8 g/dl, lytes normal

Sebastian



Day 5

- Fever has resolved, feels better
- Eating chicken, but not rice
- Urinating on own, but does not empty the bladder
- Can support weight on rear legs but not front legs
- If ulcer perforates, owners will not do surgery
- PCV 20%, albumin 1.8 g/dl

Sebastian



Day 6

- Will not eat, no fever
- When put on feet, attempts to move forward, but can not move front legs well yet, can take a few steps
- Urinating on own
- neutrophils 75K, monocytes 1,100/ul
- No stools passed, but melena on thermometer

Ultrasound

Sebastian



Day 6

- Will not eat
- When pulled up but can't move
- Urinating
- neutrophils
- No stools

but can
steps

nds
er

Ultrasound



Sebastian



Day 6

- Will not eat, no fever
- When put on feet, attempts to move forward, but can not move front legs well yet, can take a few steps
- Urinating on own
- neutrophils 75K, monocytes 1,100/ul, 6% bands
- No stools passed, but melena on thermometer

Ultrasound

- Local peritonitis R Cranial abdomen

Sebastian



Plan

- Drained fluid percutaneously
- Discontinue catheterization
- Continue milk thistle, ampicillin, enrofloxacin, carafate, famotidine, Vit K, IV fluids
- Wrap front feet to prevent abrasions from knuckling

Sebastian



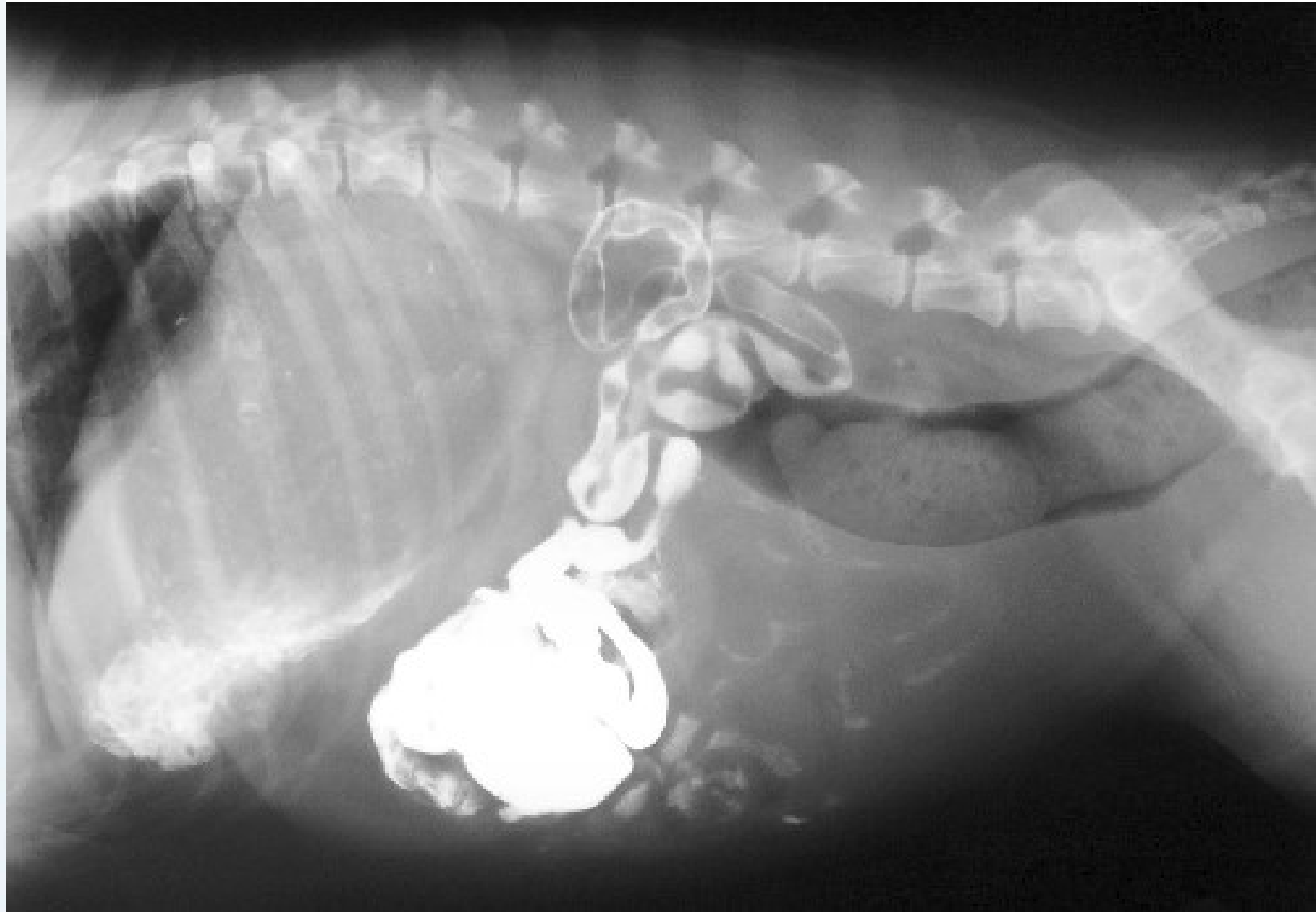
Day 7

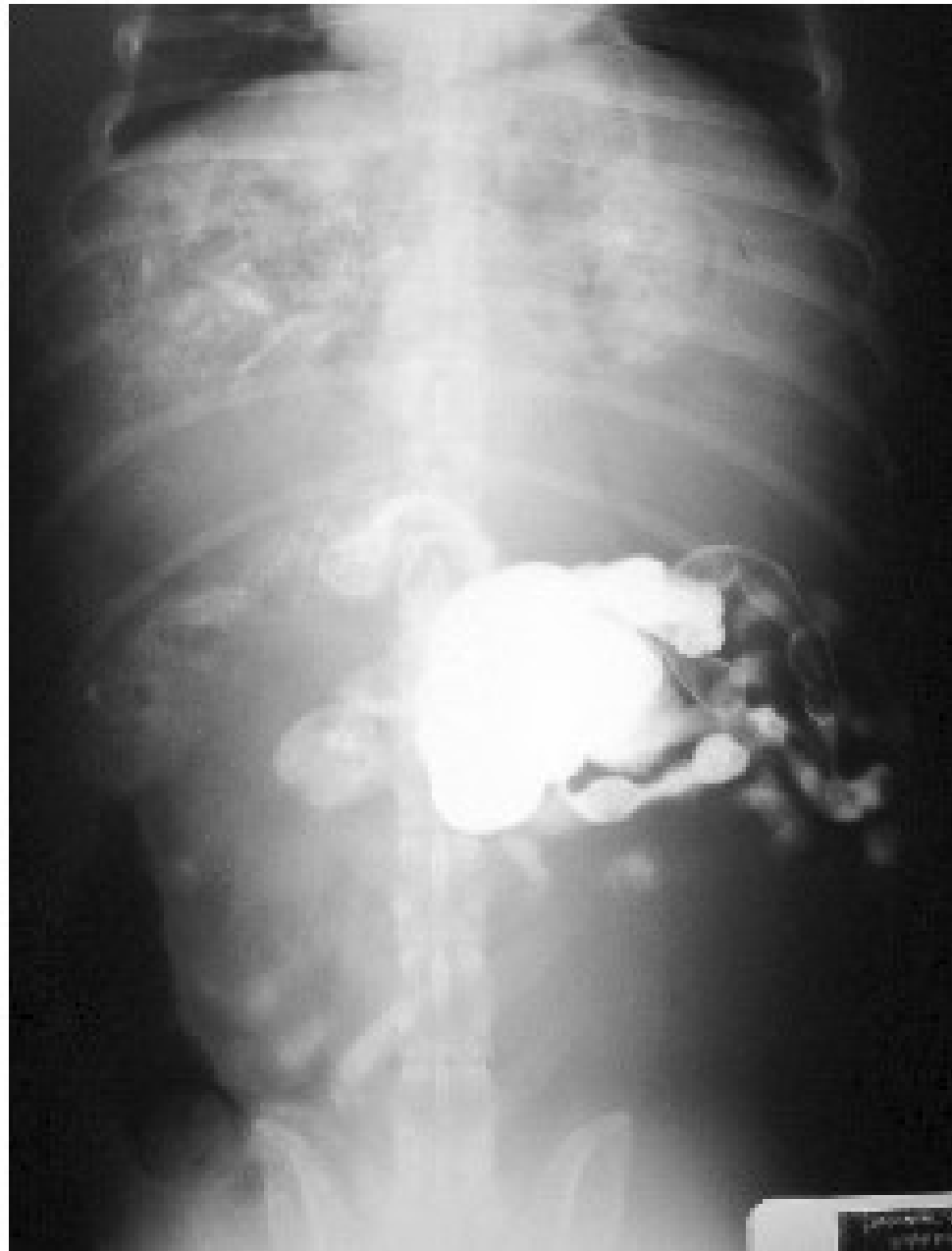
- neutrophils 38K, monocytes normal, 3% bands
- HCT 20%
- Albumin 1.6 g/dl, glob 5.3 g/dl
- SAP >4600 U/L, ALT 1868, bili 6.7 mg/dl
- Black tarry liquid stools

Plan

- Barium 5ml/lb PO

Sebastian





Sebastian



Sebastian



Day 8

- Owners came to visit – Sebastian ate a rib eye
- Can walk 5-10 feet without assistance

Over the next 2 weeks

- Switched from injectable to oral meds
- Recovered well

Recurrence of liver failure 1 year later

- Owners elected euthanasia

Lessons from “Pooper”



- Tramadol + some behavioral meds (SSRIs) can = serotonin syndrome (tremors)
- Dog with severe liver disease tend are predisposed to steroid GI side effects
- Barium is probably the best GI ulcer protectant on the planet
- Recovery from acute episodes of chronic liver disease can be very unpredictable
- Severe chronic inflammatory liver disease often ends in an acute liver failure episode
- Sedation can decompensate liver patients
- Pay attention to gastric axis on abdominal x-rays

Bella

- 12 year old female Man Eating Chihuahua
- Had foreign body removal surgery 4 days ago
- Ate for 2 days after surgery, voraciously
- Won't eat today
- No PPE needed for cage extraction today ☹️
- Her belly seems swollen



Bella

- Abdominal Radiographs

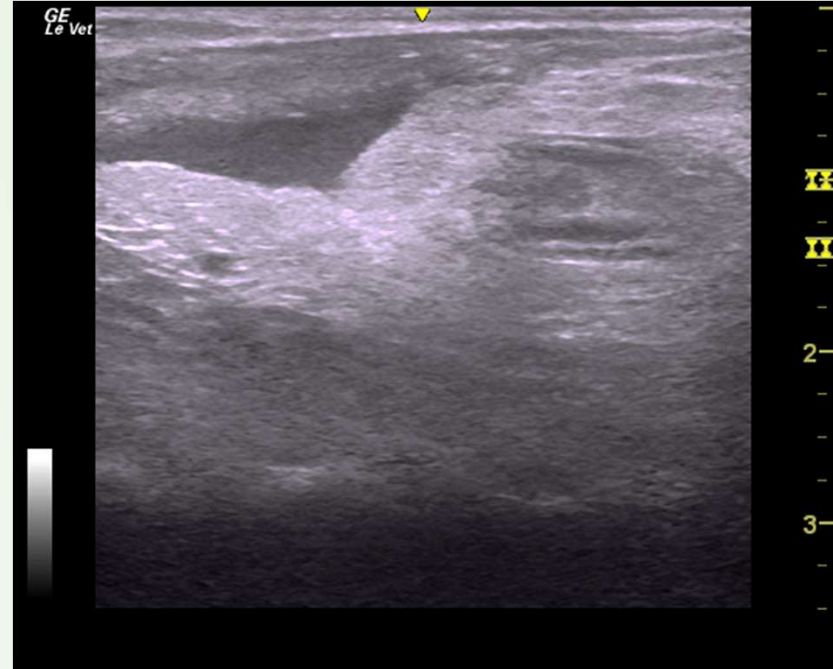
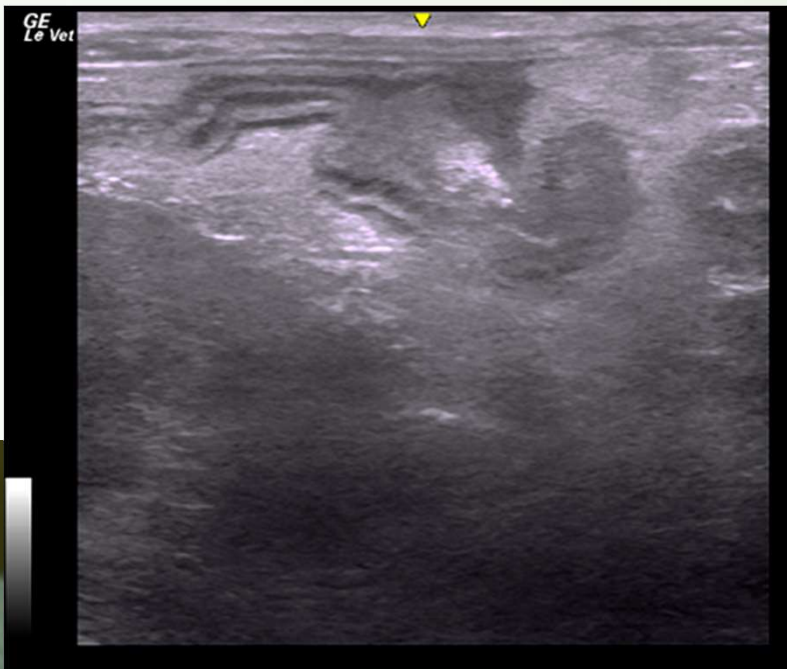


- Abdominal Rad



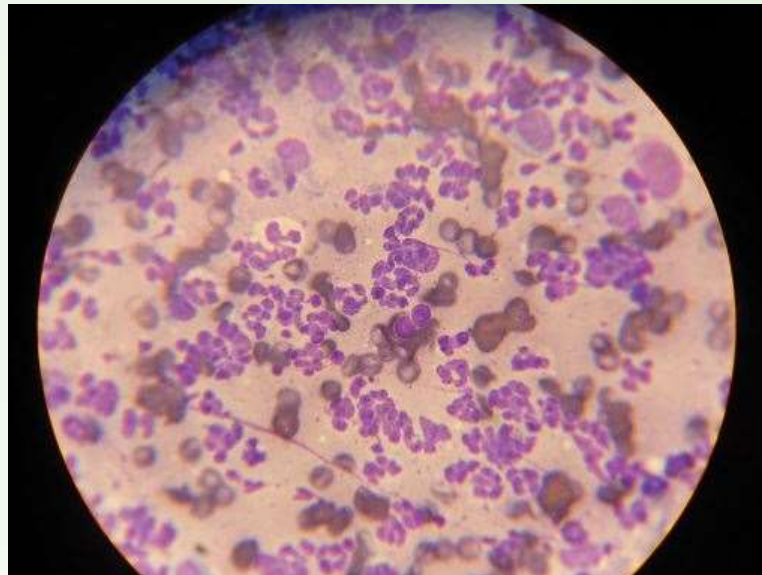
Bella

- Abdominal Ultrasound



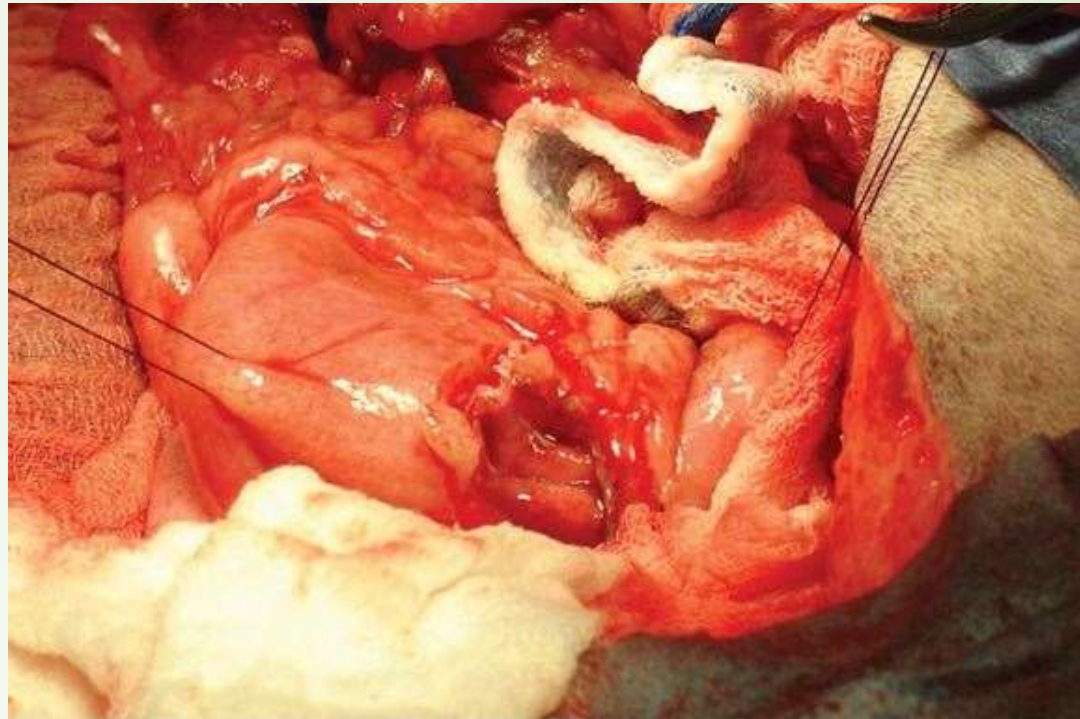
Bella

- Abdominocentesis



Bella

- Surgery



Summary

- PowerPoints - [Ultrasound GI Cases](#)
- .pdf of PowerPoints - [Ultrasound GI Cases](#)
(1 and [6 slides](#) per page)
- [Fluid Analysis Diagnostic Chart](#)
- Article: [Pseudo-obstruction in the Dog](#)
- Story: [Bulldog - Lessons in Forgiveness](#)



Acknowledgements

- Connolly Animal Clinic - “Elvis,” “Mandy” & many case example images (Dr. Mike Connolly)
- Eastex Veterinary Clinic - “Elvis,” “Bull Dog” and many case example videos (Drs. Jimmy Weatherly, Jason Richards & Kevin Acuna)
- Southwood Drive Animal Clinic - many case example videos (Drs. Shawn Penn & Doug Ashburn)
- Ward Animal Hospital - “McDuff” (Dr. Theresa Fuess)
- Pinewoods Vet Clinic - “Mandy” (Dr. Doug Jungmann)

