VET STRATEGY

02

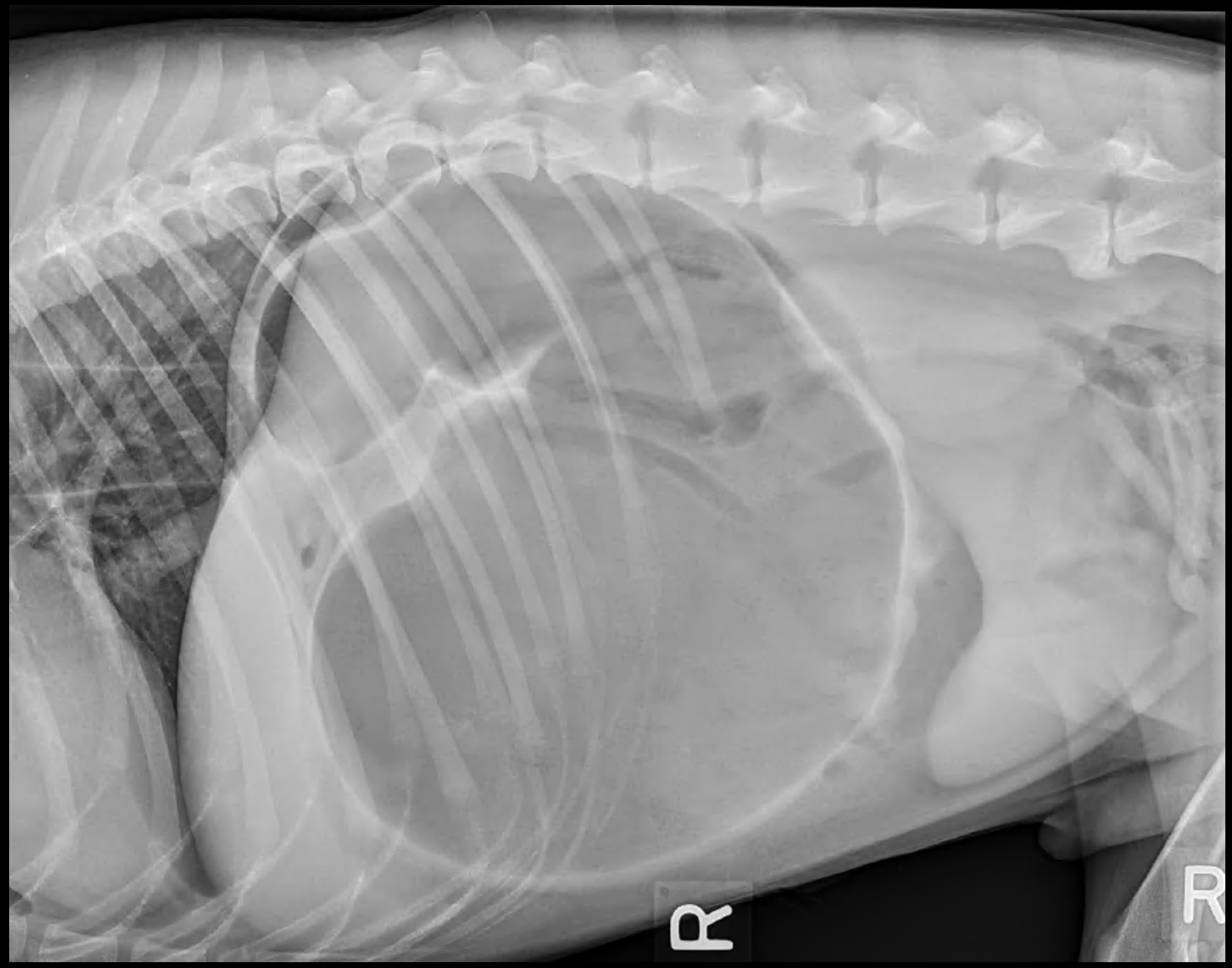
- *Pitfalls of GDV*

10am – 10:40am

- Pitfall on X rays
- Pitfall in Surgery

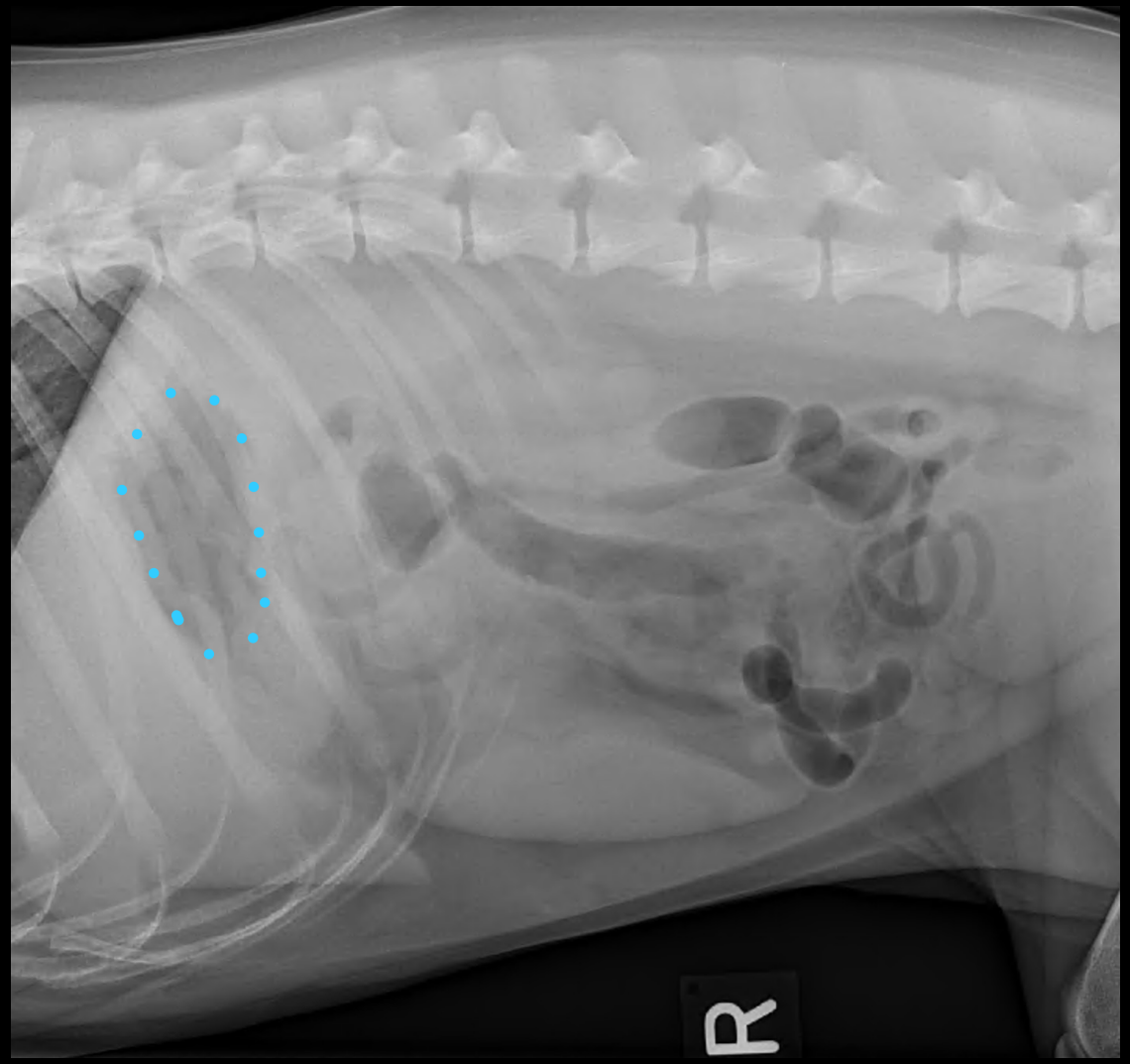
Radiographic Diagnosis of 180-degree GDV

- Single-view study: right lateral

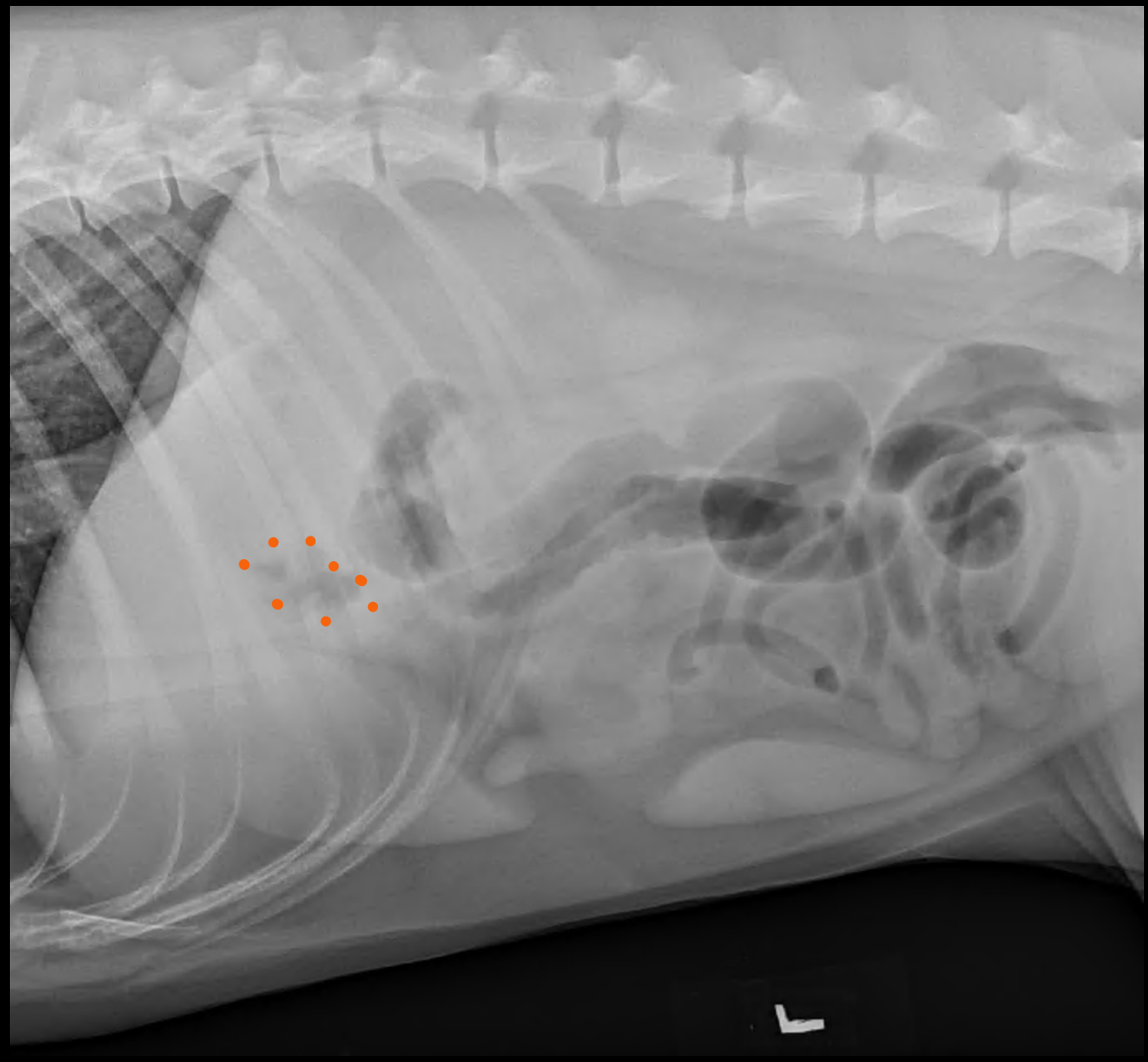


Normal abdominal radiographs - canine

- Right lateral view: gastric fundus gas-filled

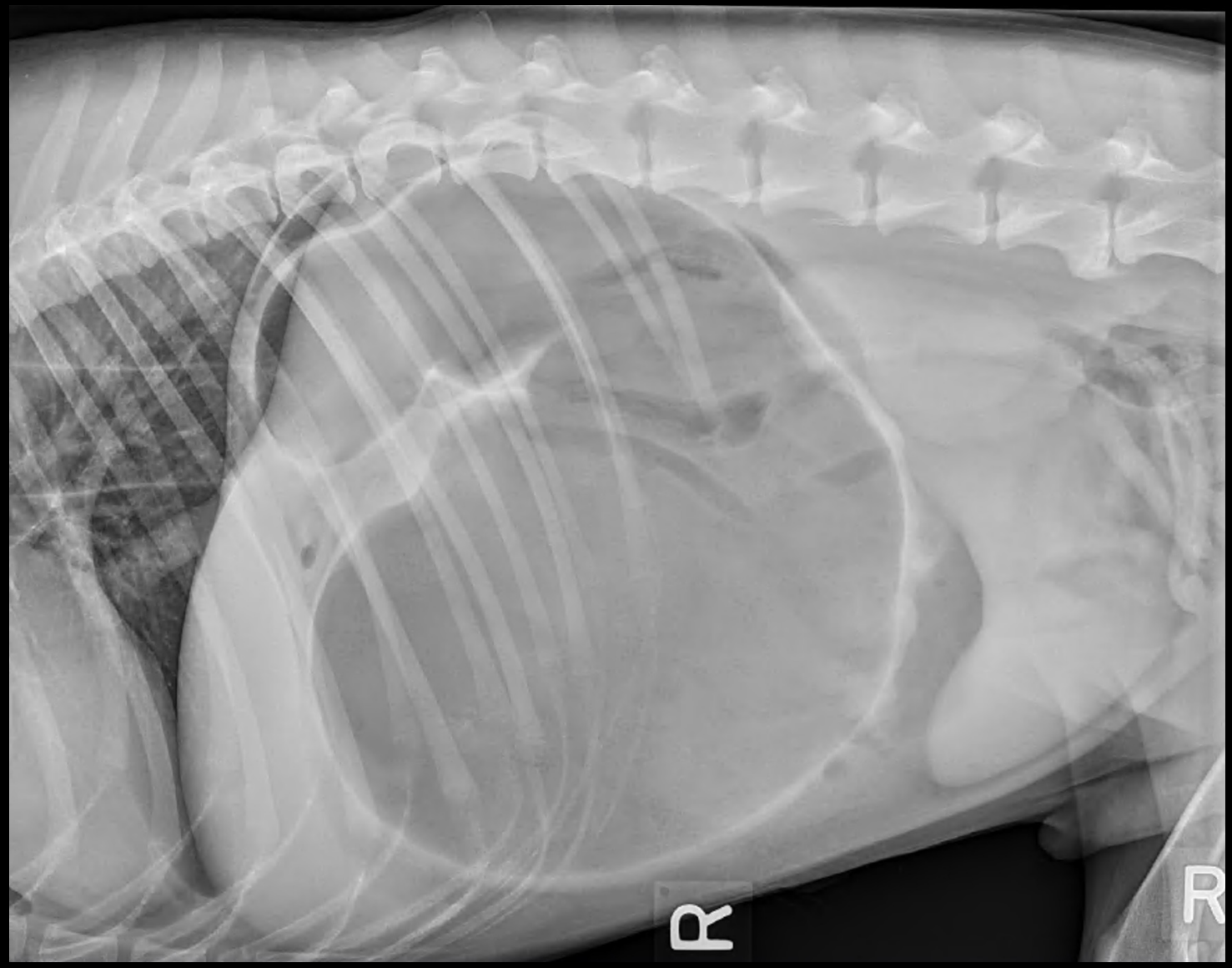


- Left lateral view: pylorus gas-filled



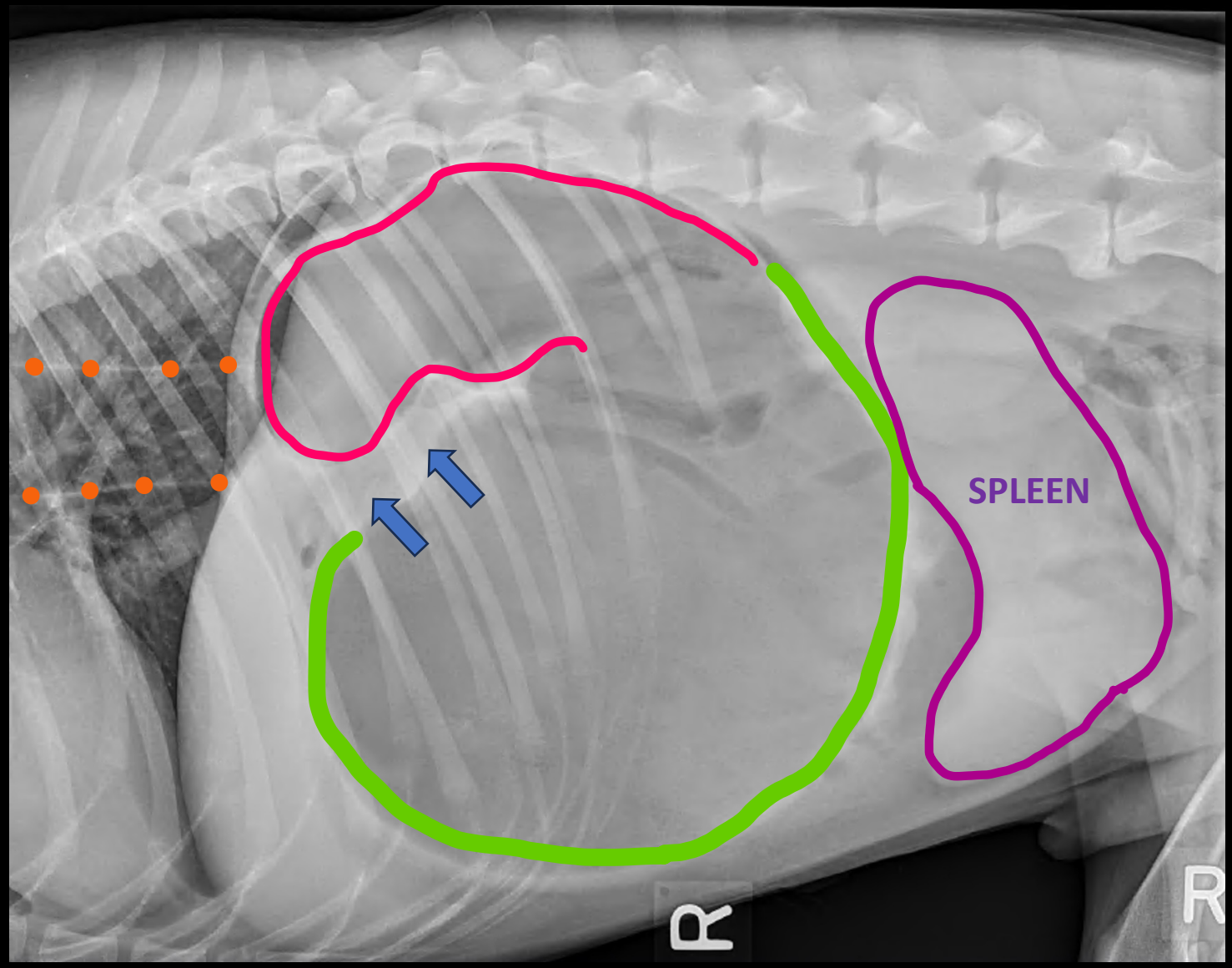
Radiographic Diagnosis of 180-degree GDV

- Single-view study: right lateral

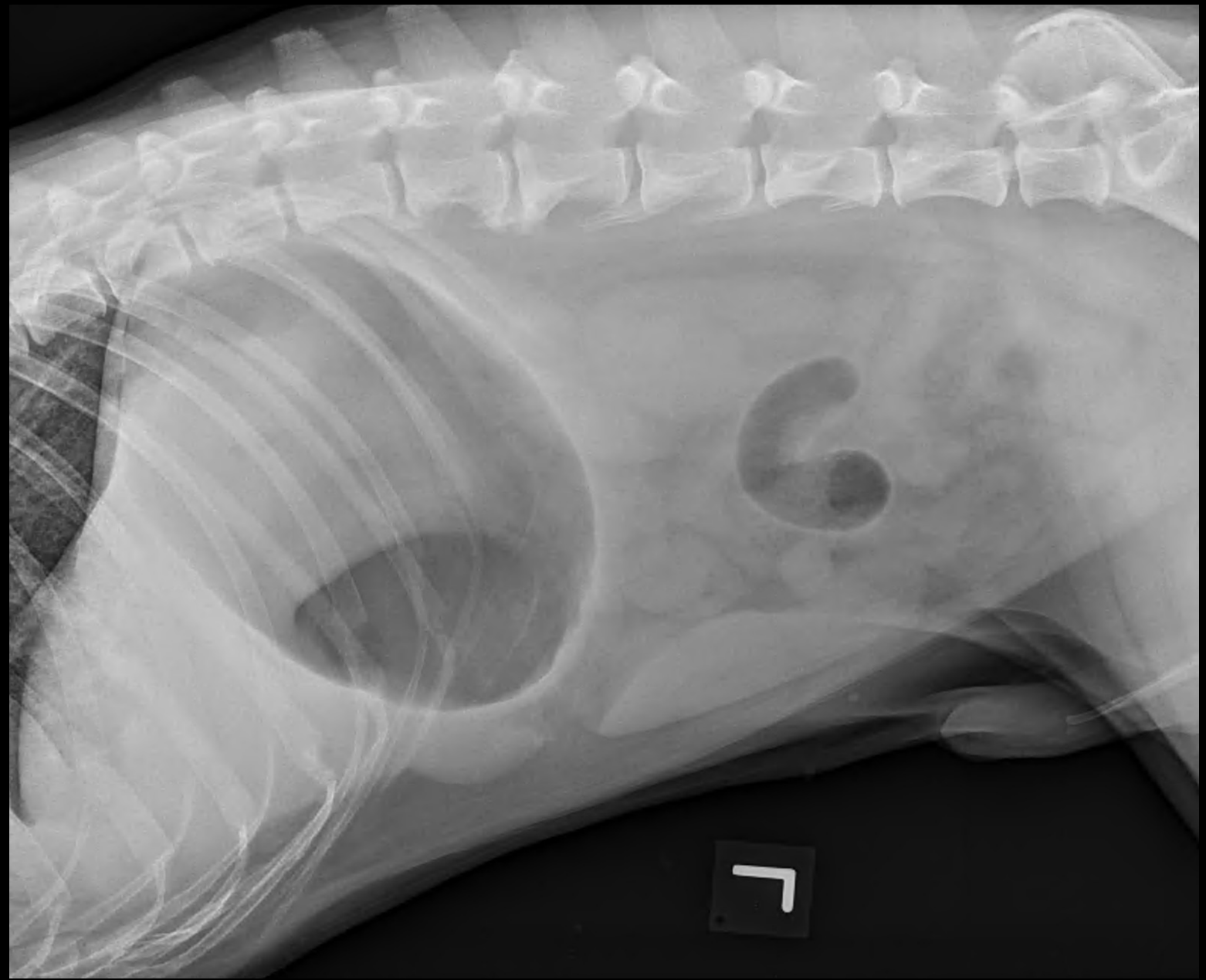


Radiographic Diagnosis of 180-degree GDV

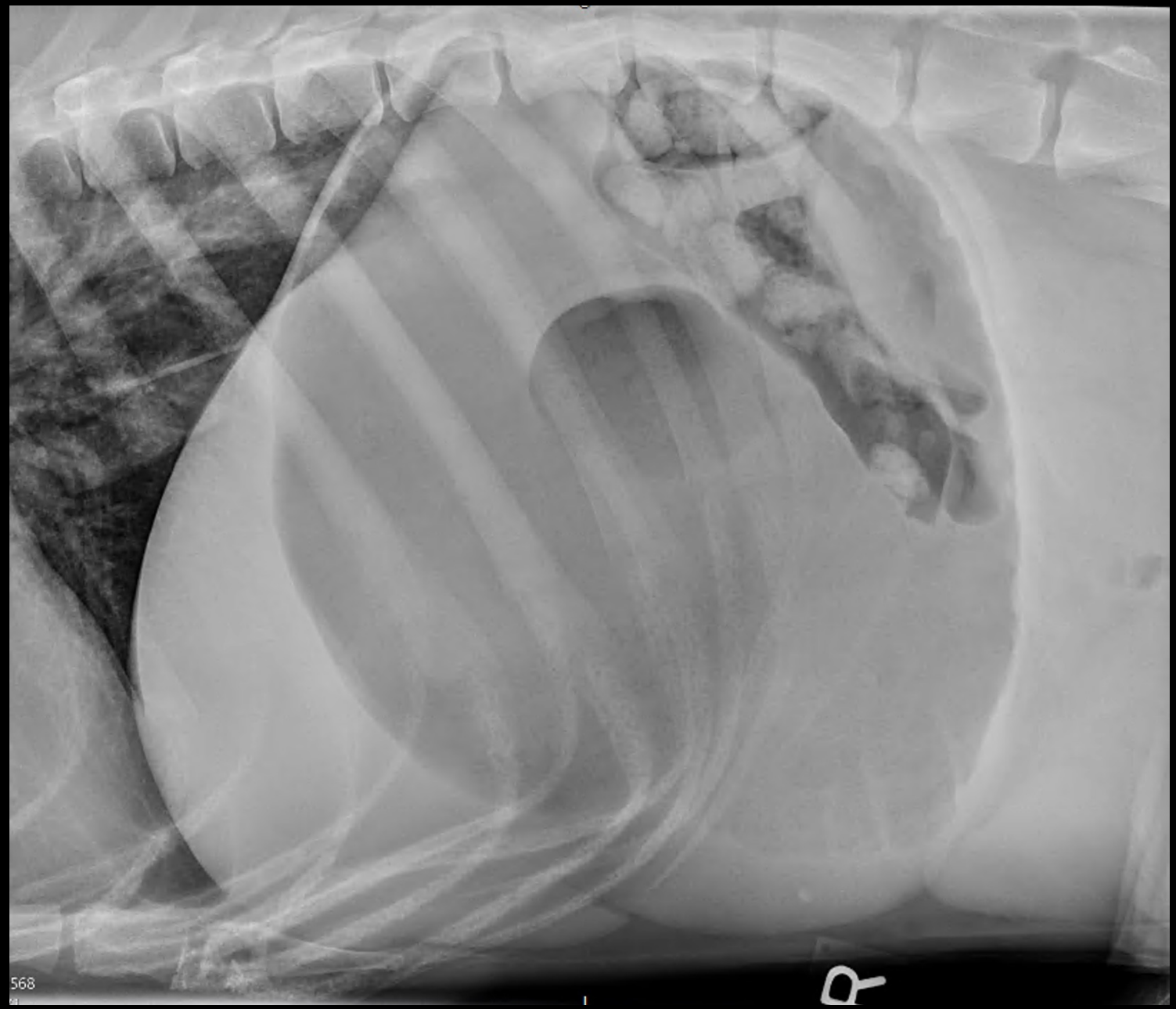
- Single-view study: right lateral
  - Pylorus displaced craniodorsally
  - Compartmentalization
  - Gastric dilation
  - Splenic mal-positioning
  - Decreased serosal detail
  - Caudal esophageal dilation

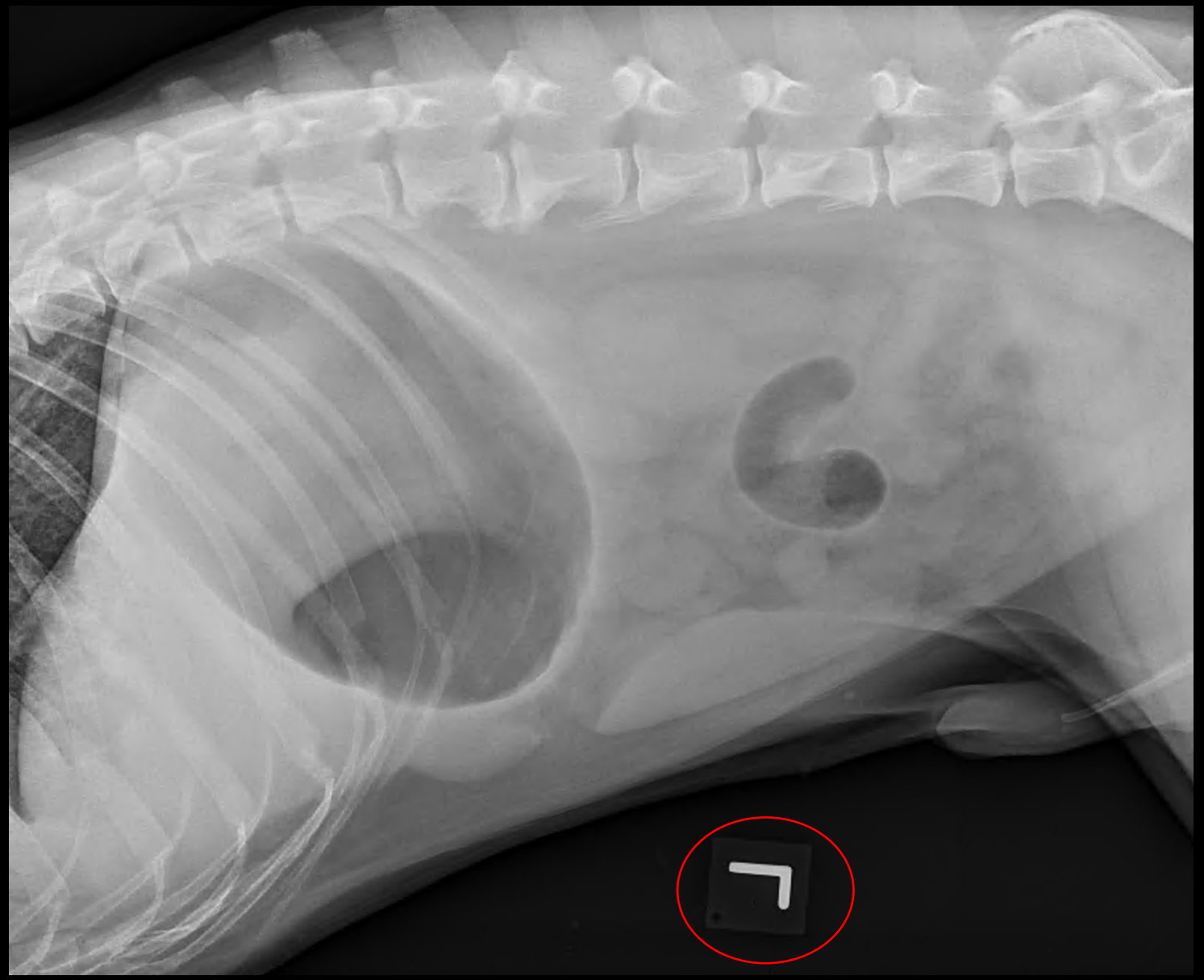


Is this a GDV?



How about this?

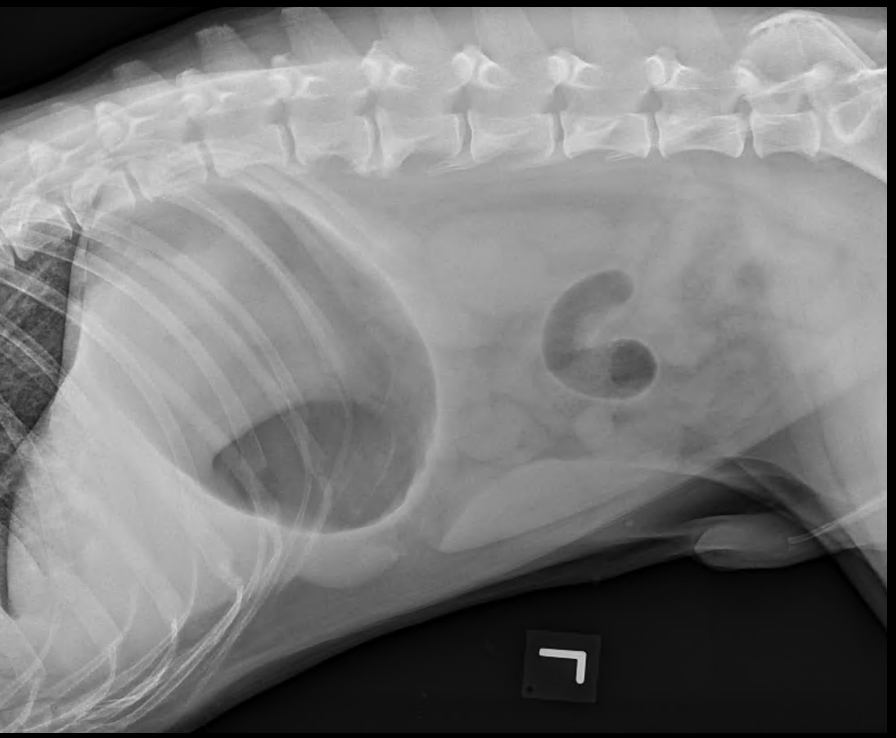


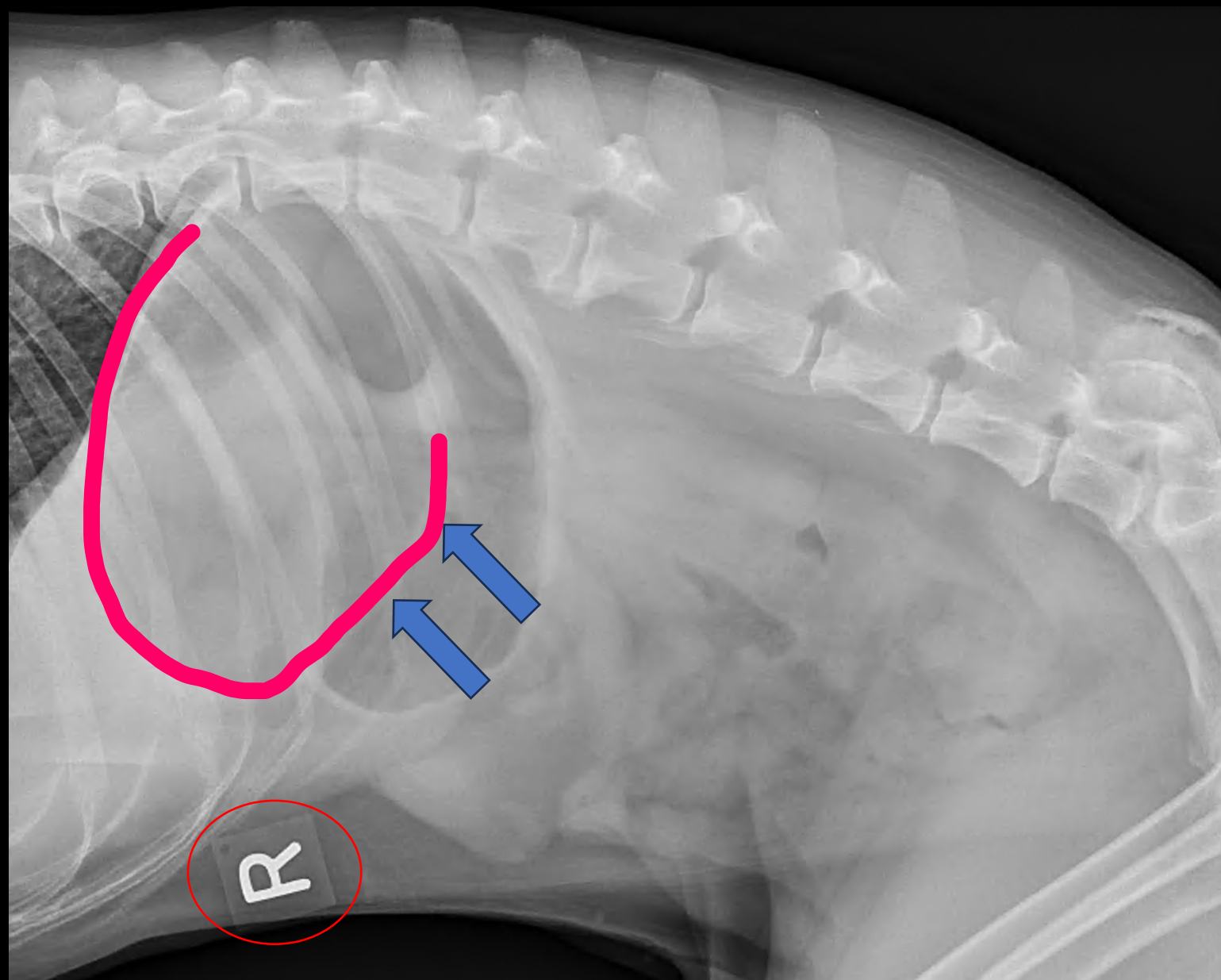


14YO, C, M, Cane Corso

- Lethargy
- Non-productive vomit
  - Dull, recumbent
  - Tachycardic (160 bpm)
  - Tachypneic
  - CRT = 3s
  - Hypotensive

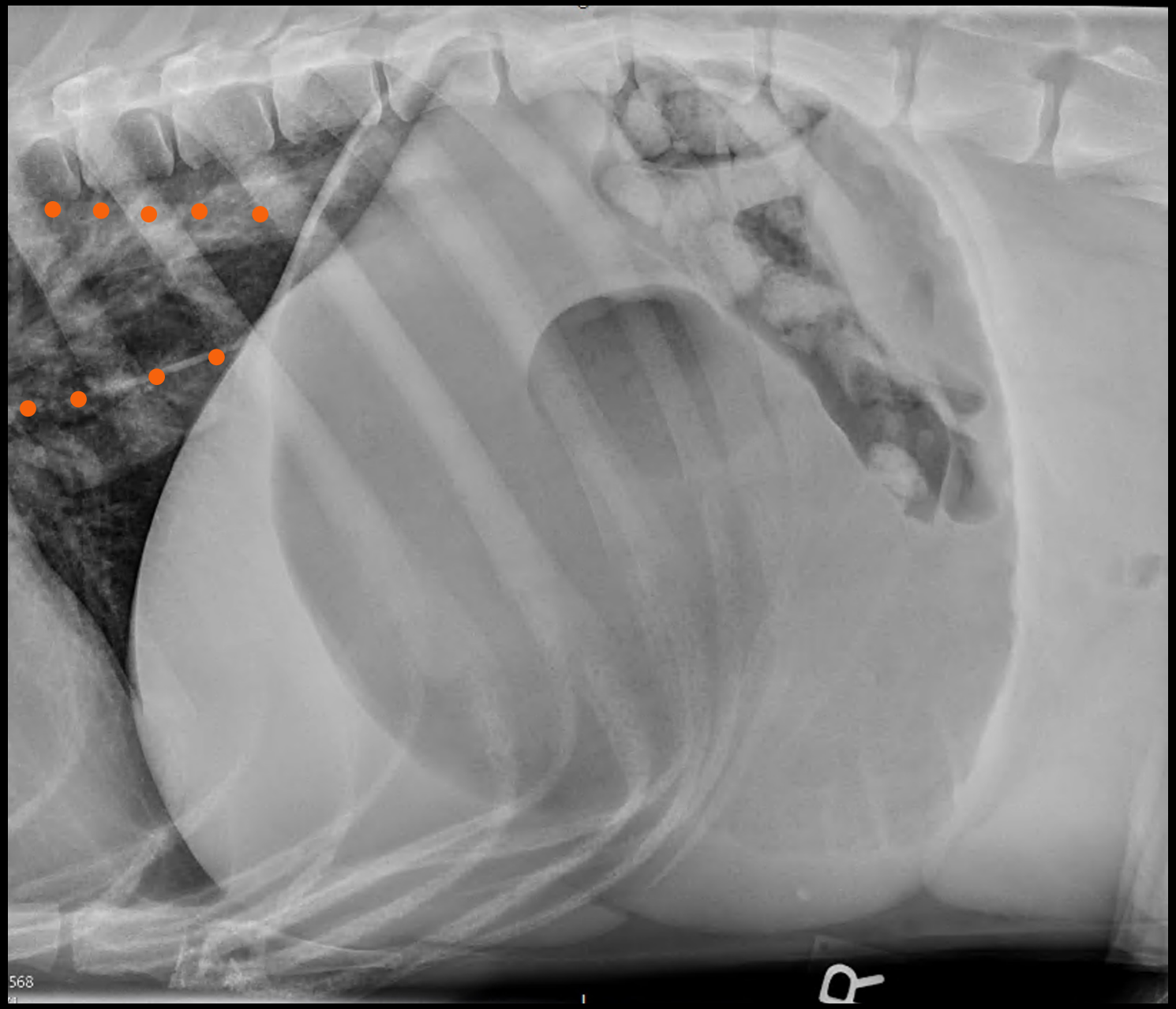
Atypical GDV





COMPARTMENTALIZATION

CRANIODORSAL PYLORUS

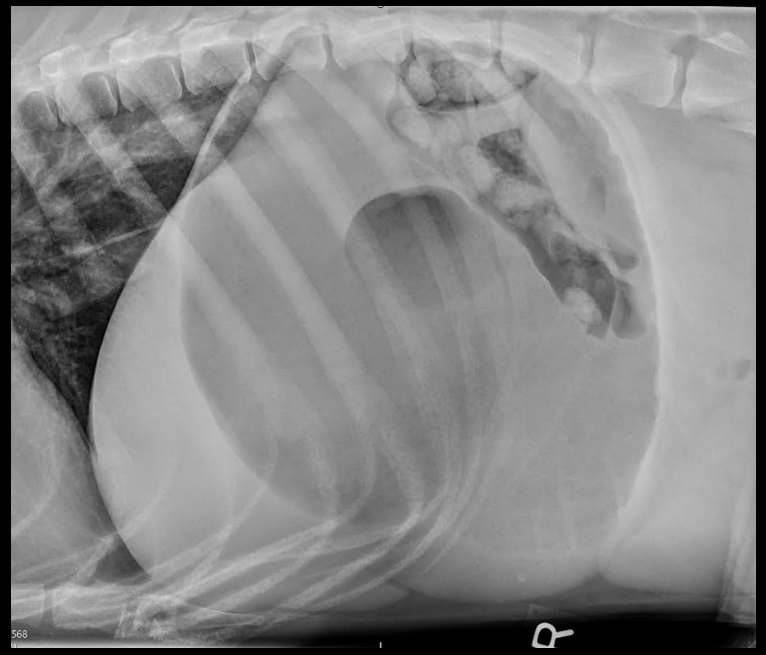


3YO, M, Great Dane

- Acute anorexia
- Drooling
- Vomiting
- Lethargy
  - QAR
  - Tachycardia (200 bpm)
- Not able to pass gastric tube

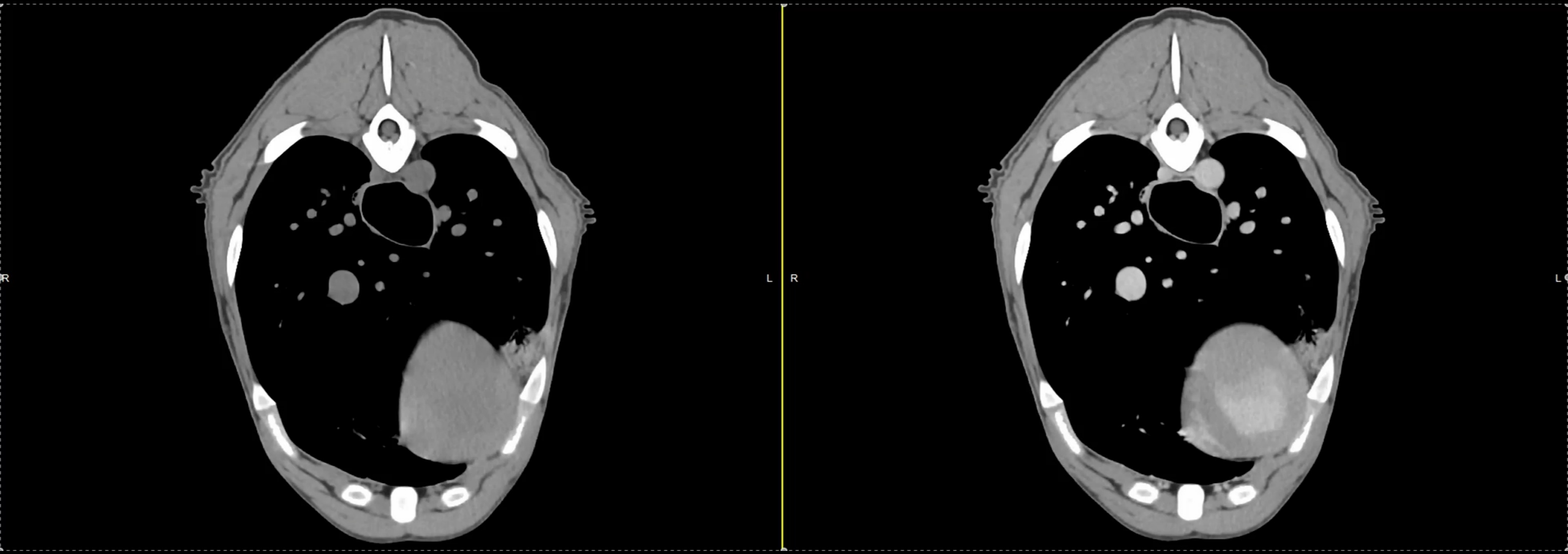
WHAT COULD BE DONE NEXT?!

360-degree GDV

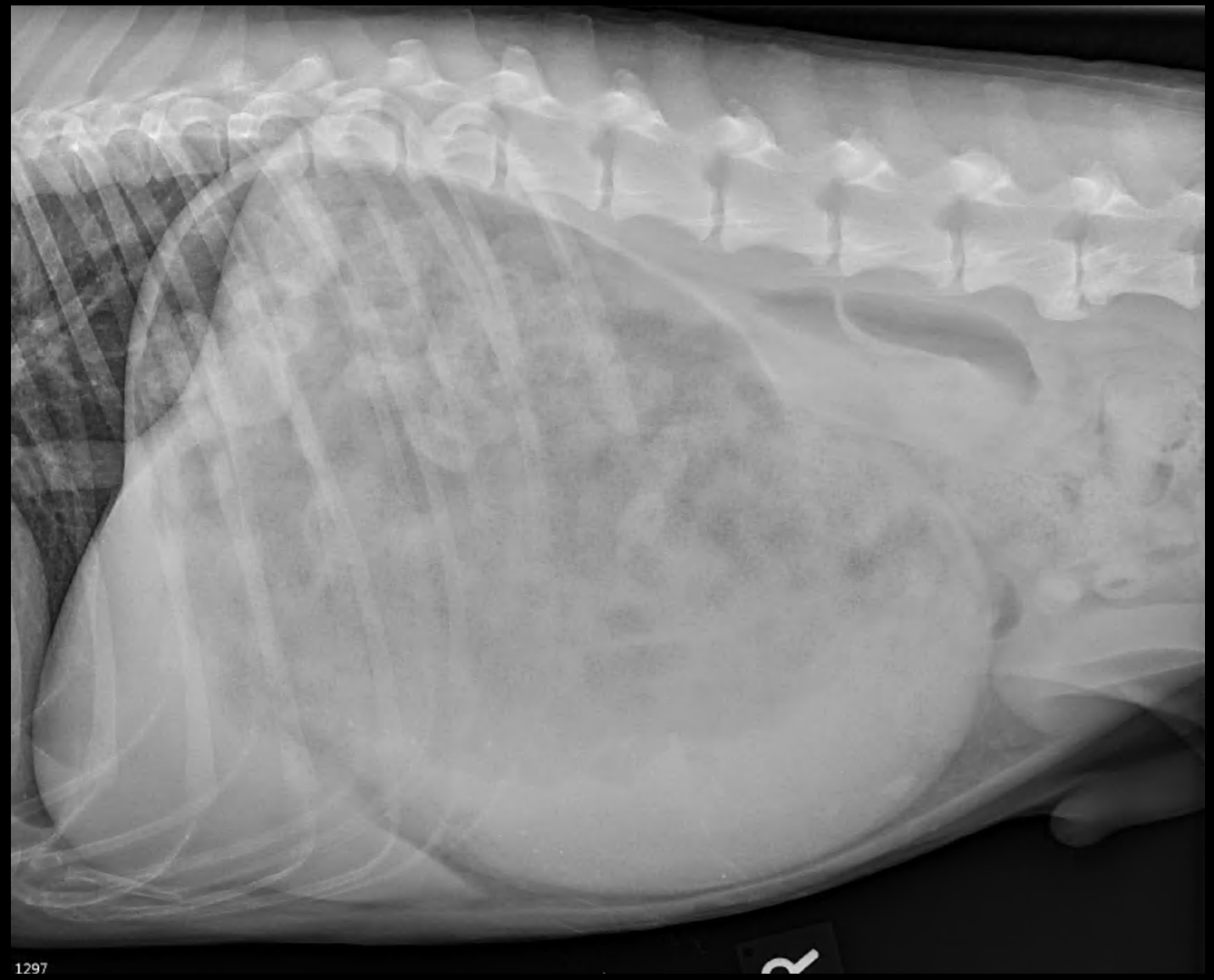


COMPARTMENTALIZATION

360-degree GDV

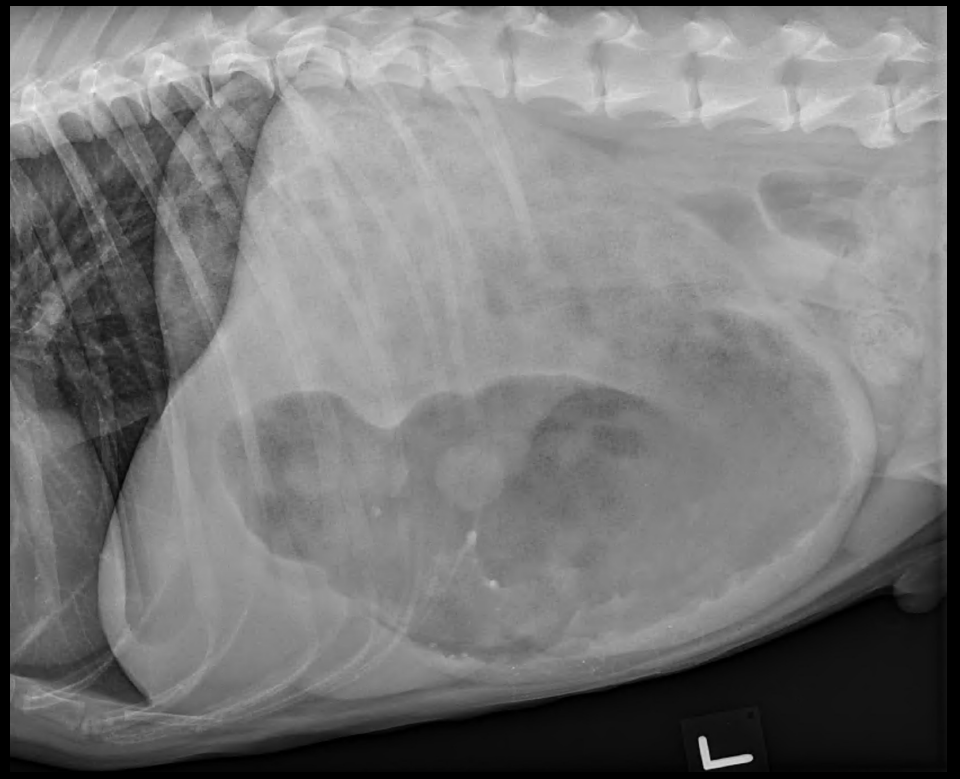


Gastric dilation – previous GDV and gastropexy



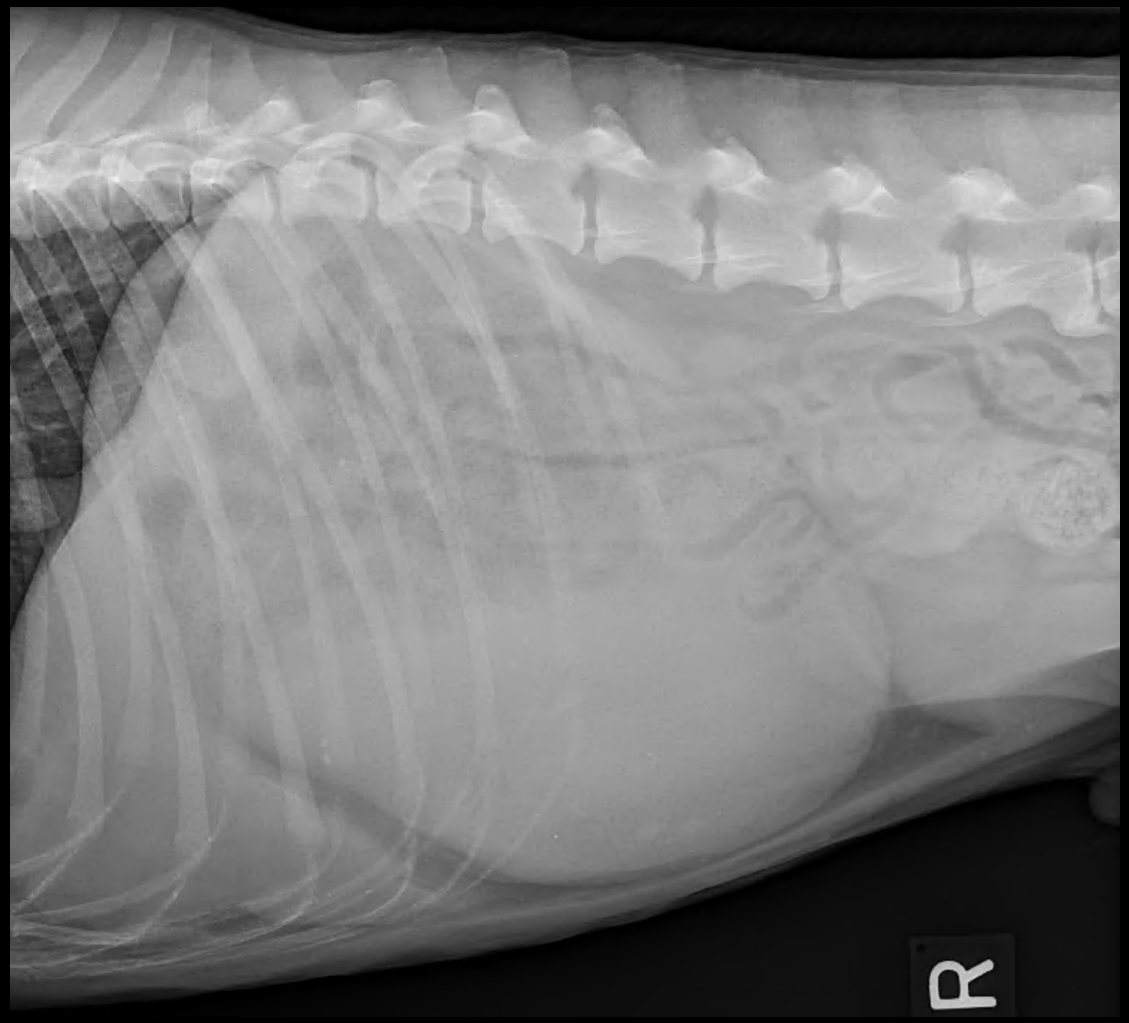
7YO, C, M, Poodle Standard

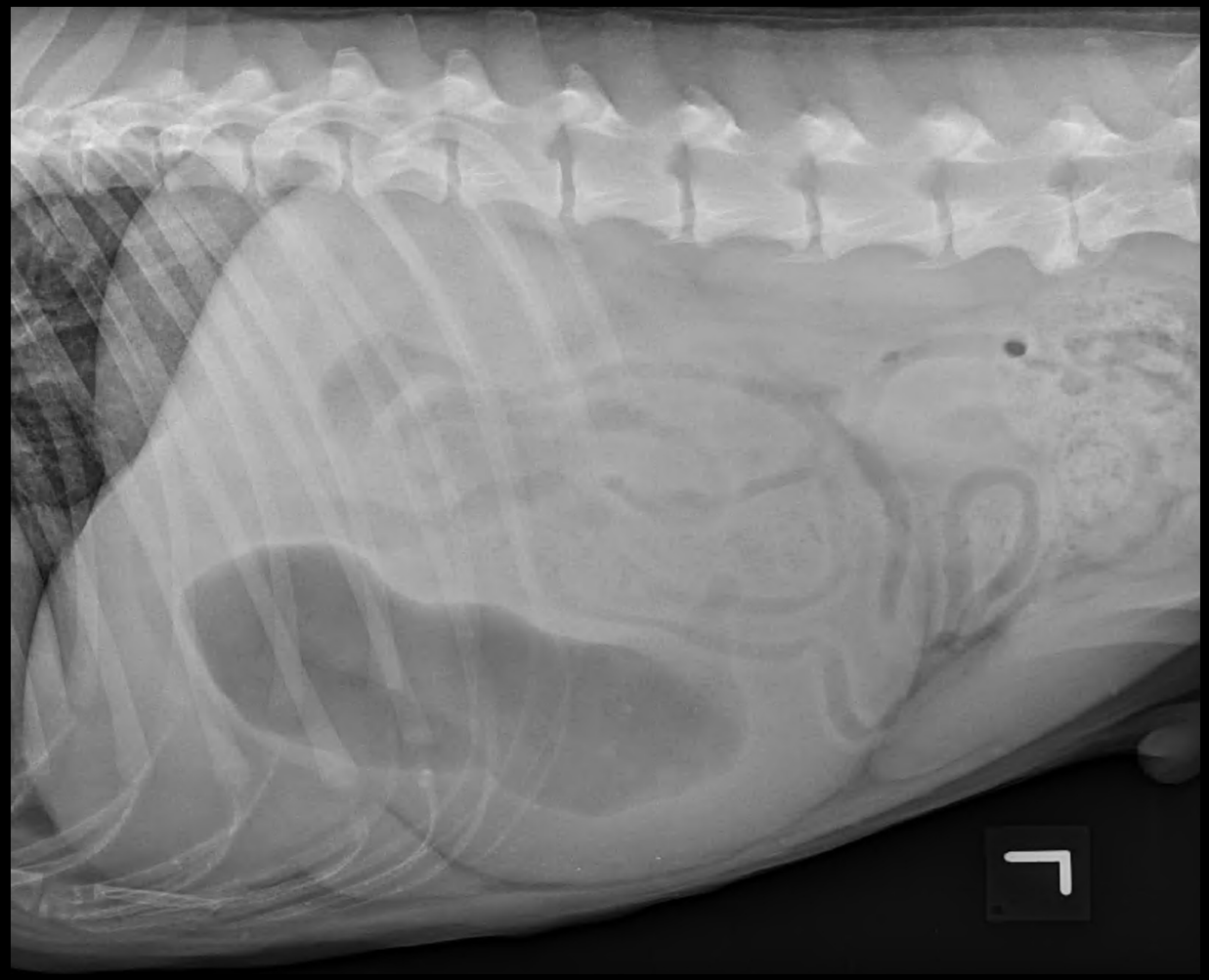
- Acute abdominal distension



Gastric dilation – previous GDV and gastropexy

Recheck abdominal radiographs

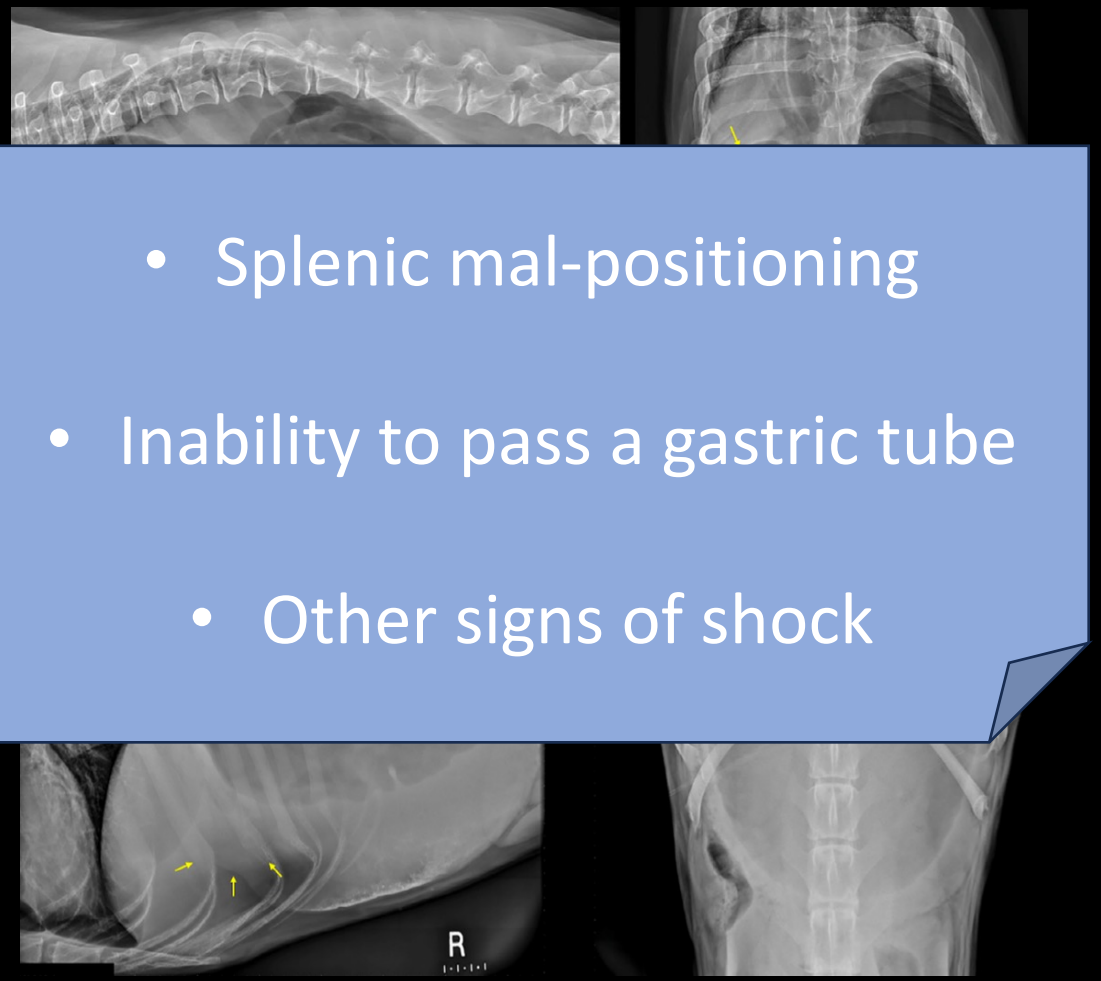




Radiographic findings in dogs with 360 degrees gastric dilatation and volvulus

Pablo Espinosa Mur[1] | Ryan Appleby[1] | Kathryn L. Phillips[2] | Ameet Singh[1] | Gabrielle Monteith[1] | Lindsey J. Gilmour[3] | Erin Keenihan[4] | Lise Daniaux[5] | Alex zur Linden[1]

360 GDV



- Splenic mal-positioning
- Inability to pass a gastric tube
- Other signs of shock

16 dogs with 360 GDV – radiographic findings

- Severe esophageal distension
- Lack of small intestinal dilation
- Marked degree of gastric distension
- Severely decreased serosal detail
- Se 43.7-50% and Sp 84.6-92.1%
- Clinicopathological findings
  - Tachycardia
  - Hyperlactatemia
  - Elevated PCV

Surgery

GDV Surgery Points

- Before Surgery
- De-rotation
- Gastropexy
- Prognosis

Straight forward procedure

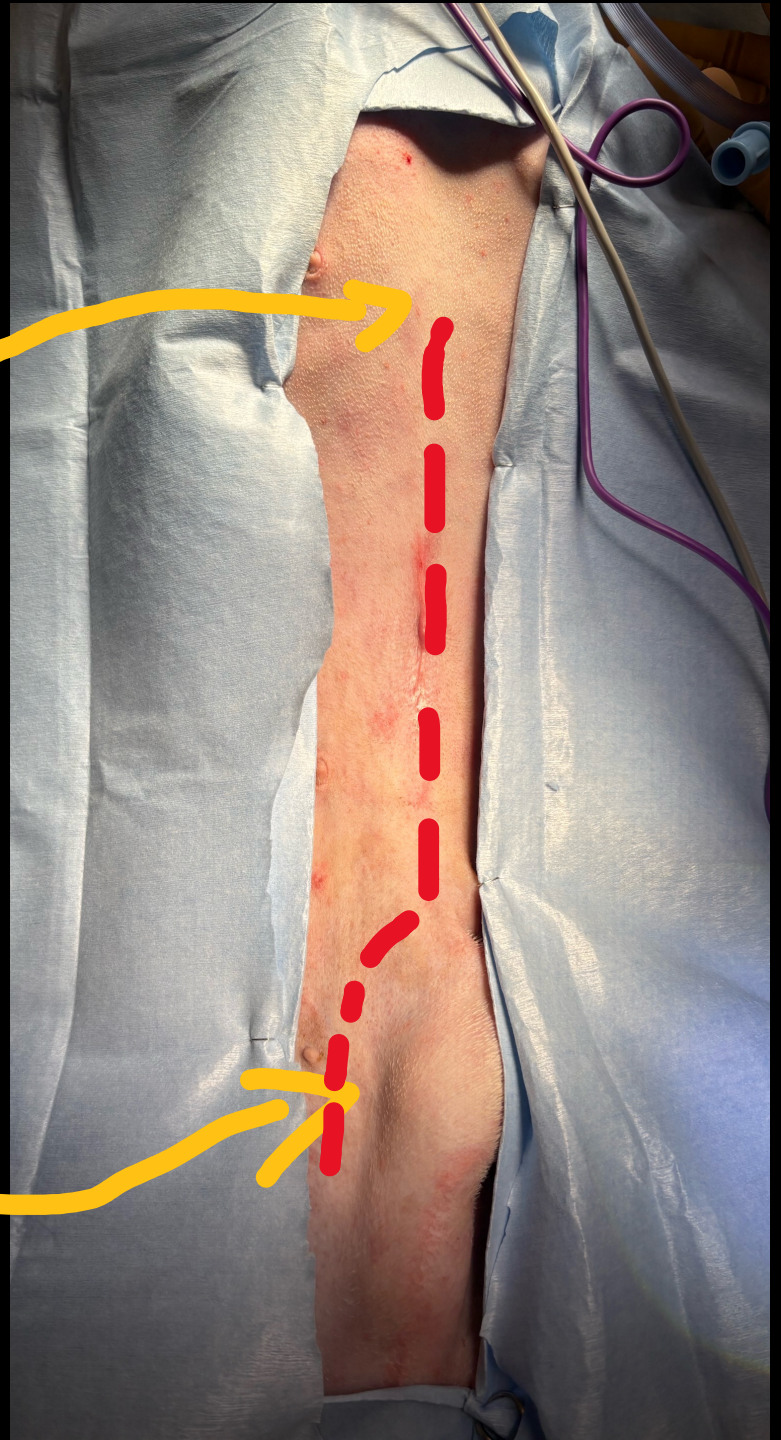
Sometimes, it is not

Before Surgery

- Fluid
  - IV catheter x 2
    - Front limbs
- Decompression
  - Trocarization
    - 18g IV catheter
- Ready for pressor
  - Norepinephrine, Dopamine CRI
  - Lidocaine bolus/CRI

Before Surgery

- Clipping and draping wide
  - Finding unexpected
    - Splenic torsion/necrosis
    - Hemoabdomen



De-rotation

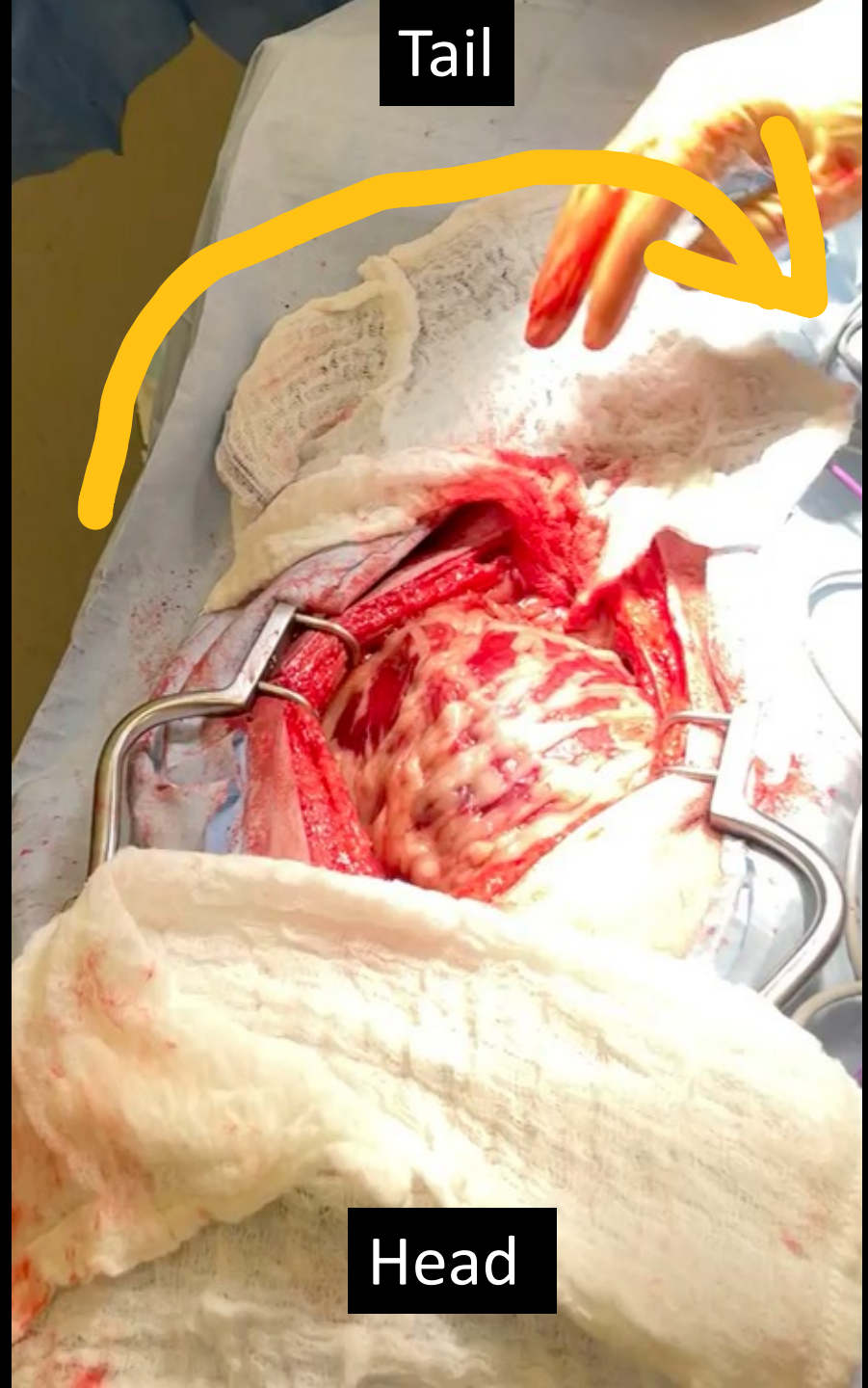
- Surgical Incision
  - Make big
  - Easier to de-rotate
- Where to Stand
  - R side of patient

De-rotation

- How to De-rotate

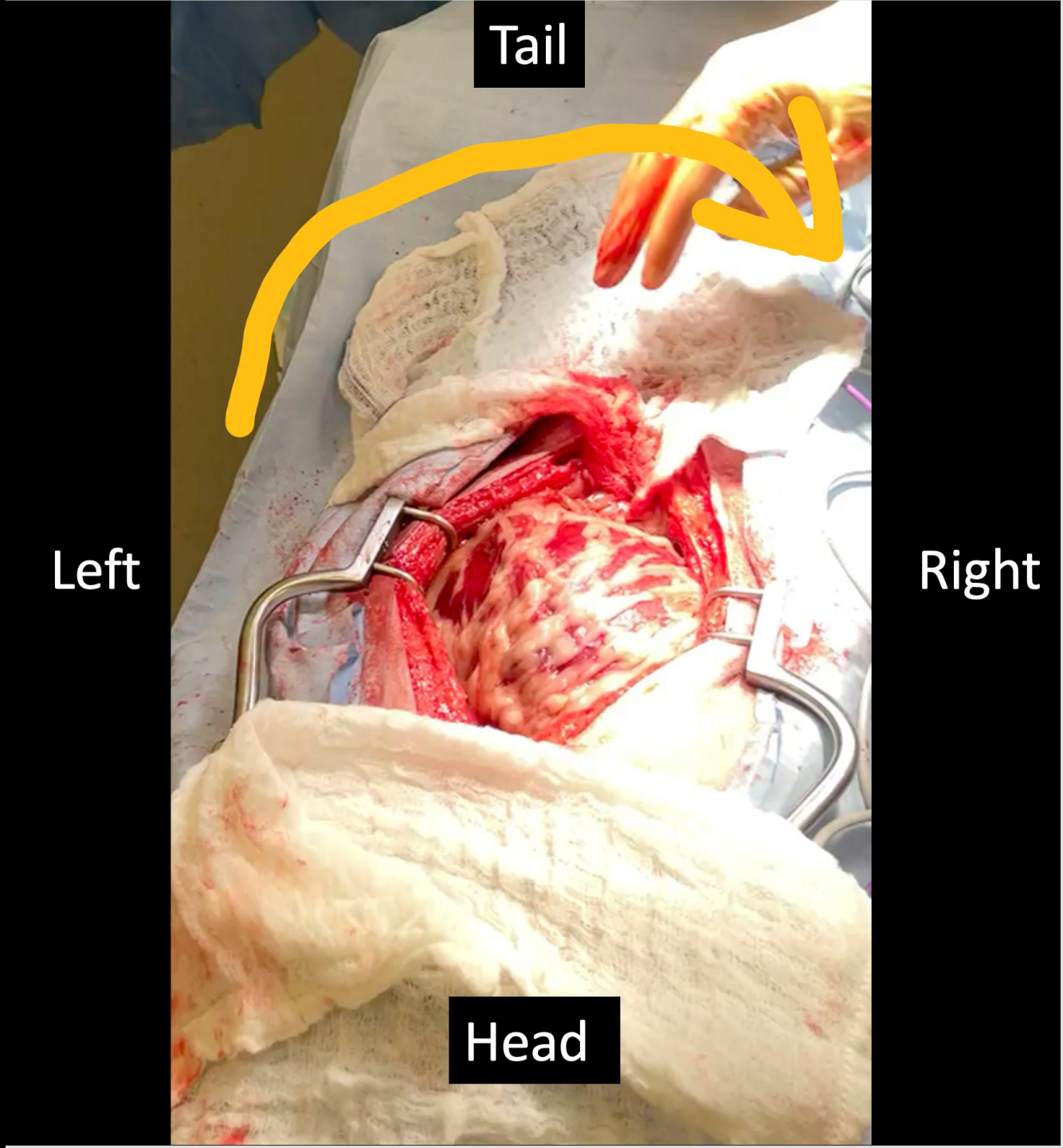
De-rotation

- How to De-rotate
  - R hand goes deep



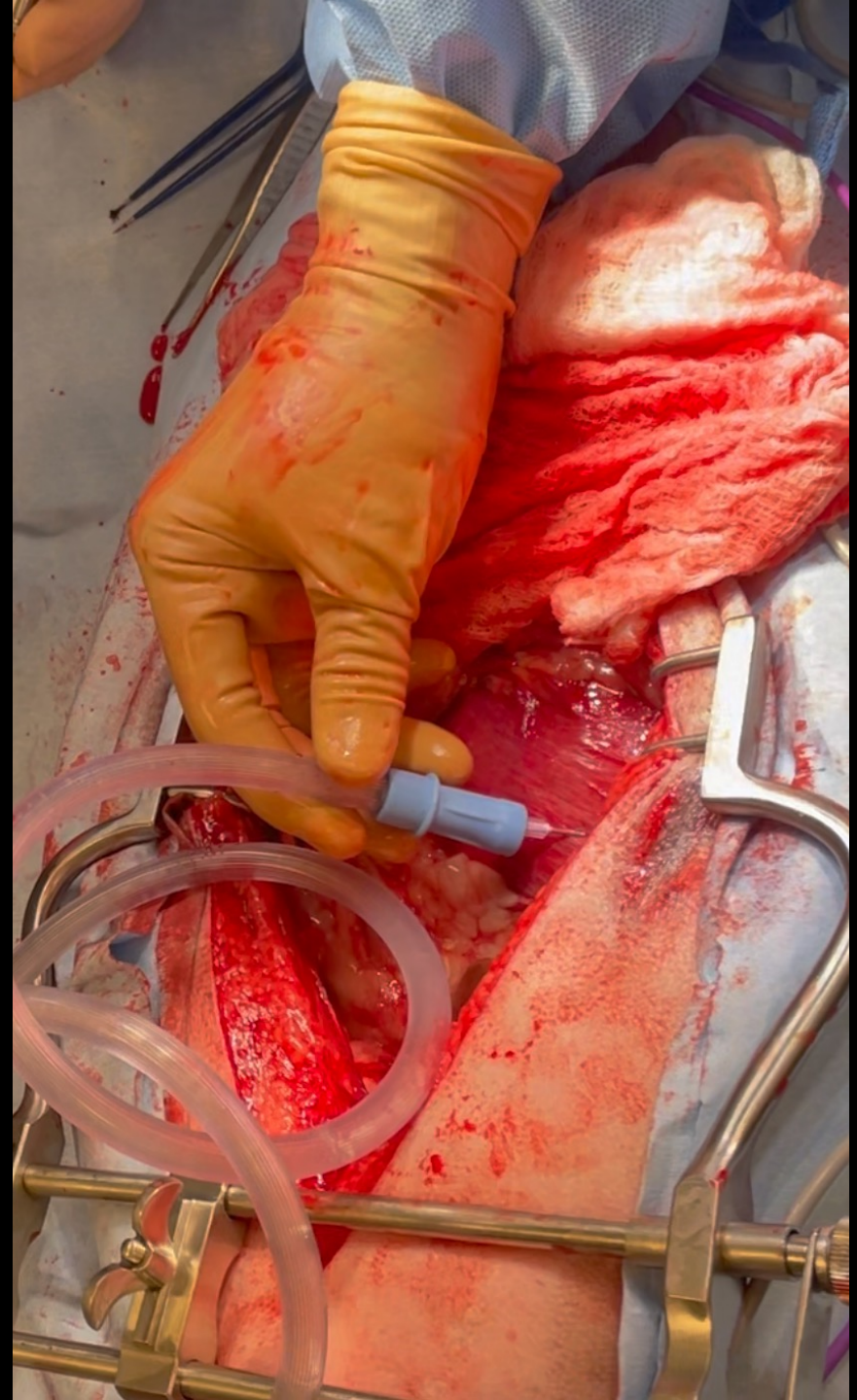
De-rotation

- How to De-rotate
  - Can be hard
    - With dilated stomach



De-rotation

- How to De-rotate
  - Can be hard
    - With dilated stomach
  - Deflate the stomach
    - 18g and a syringe
    - Then, de-rotate
      - Much easier



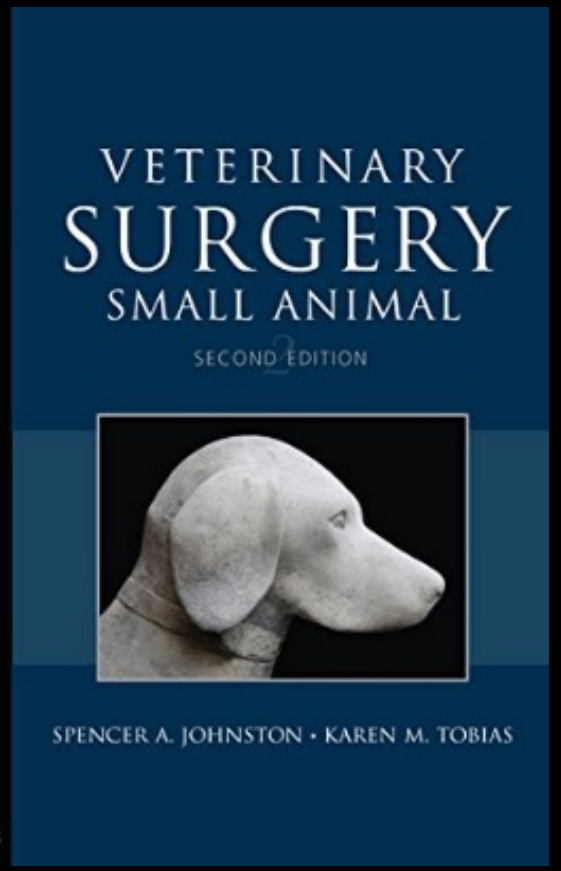
Are you sure
de-rotated completely?

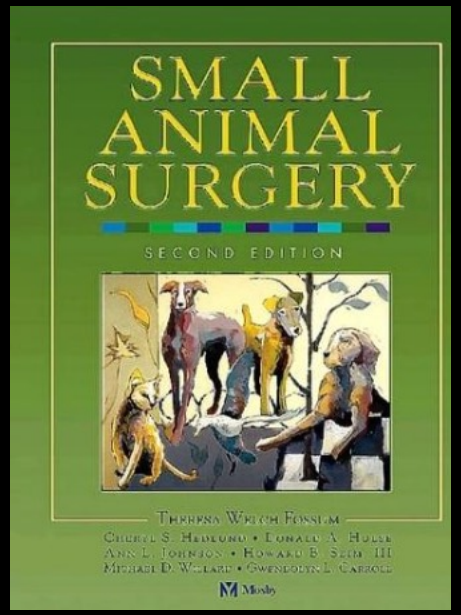
Derotation

- Check Esophagus
  - Pass gastric tube first
  - Feel the esophagus

Type of gastropexy

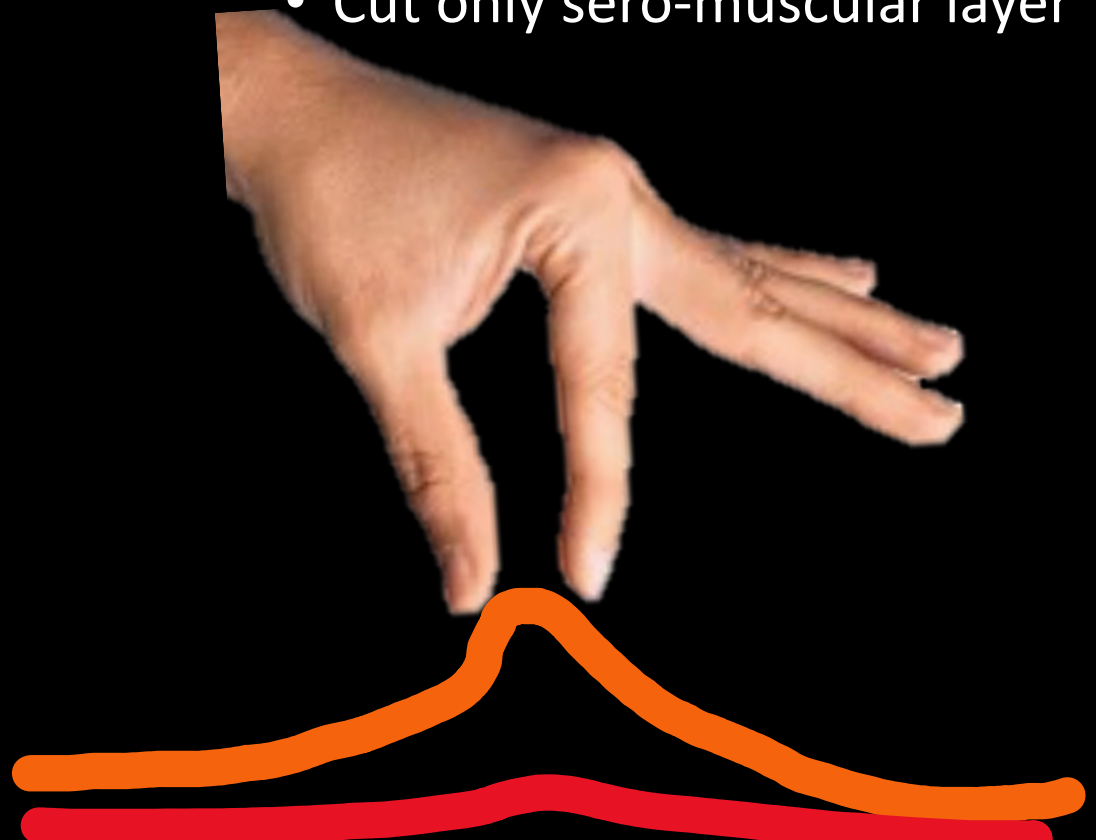
- Incisional
- ~~Beltloop~~
- ~~Circumcostal~~
- ~~Incorporating~~

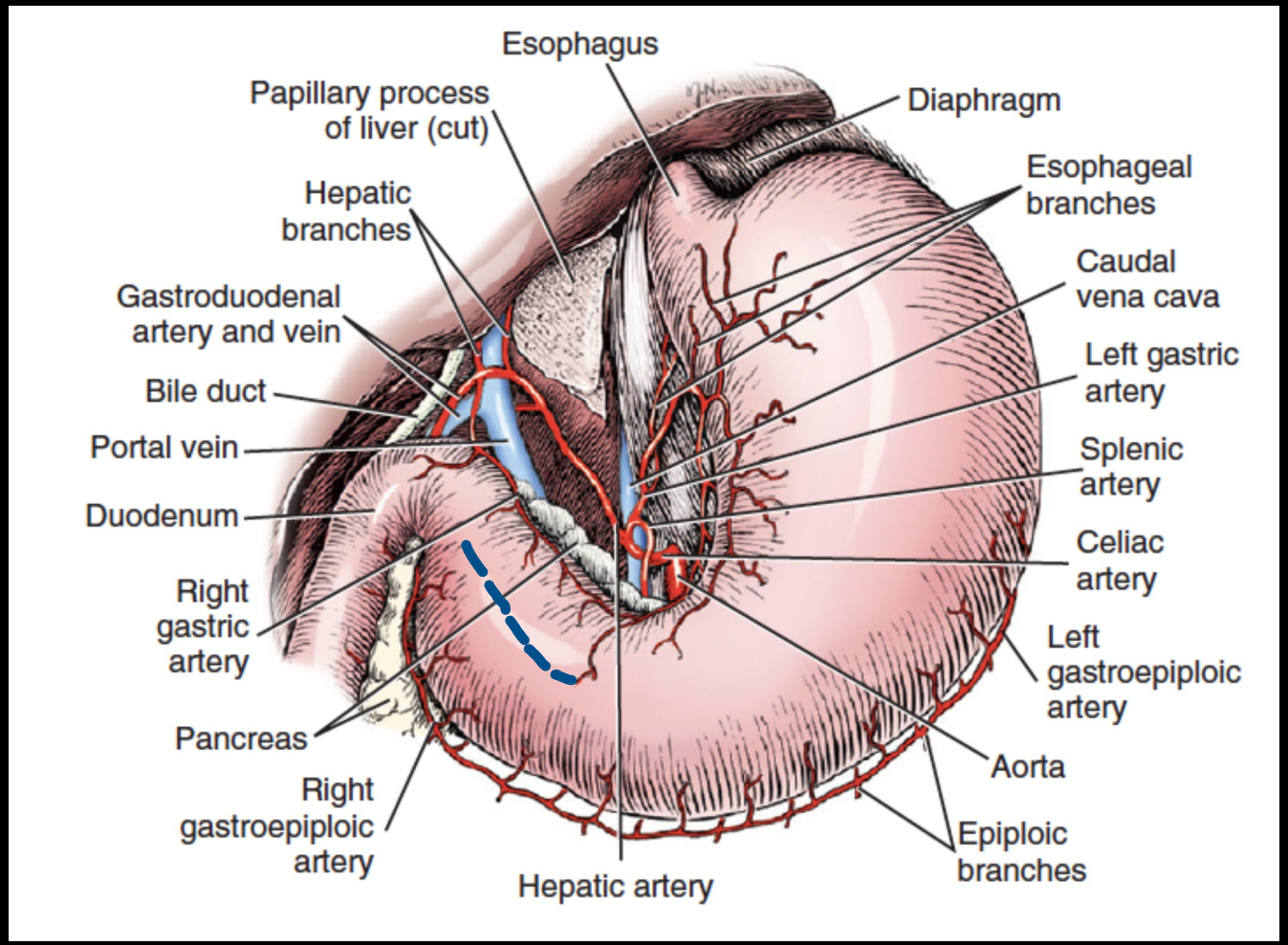




Incisional Gastropexy

- Stomach side
  - Pyloric antrum
  - Cut only sero-muscular layer





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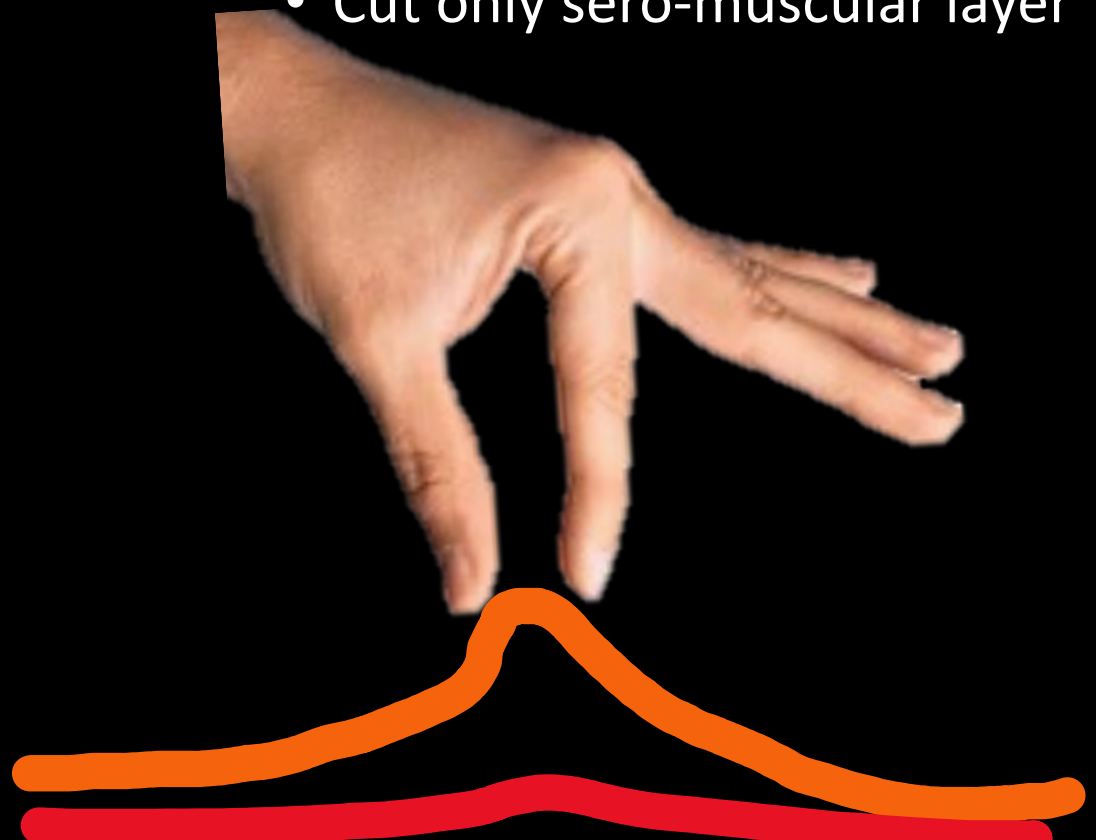
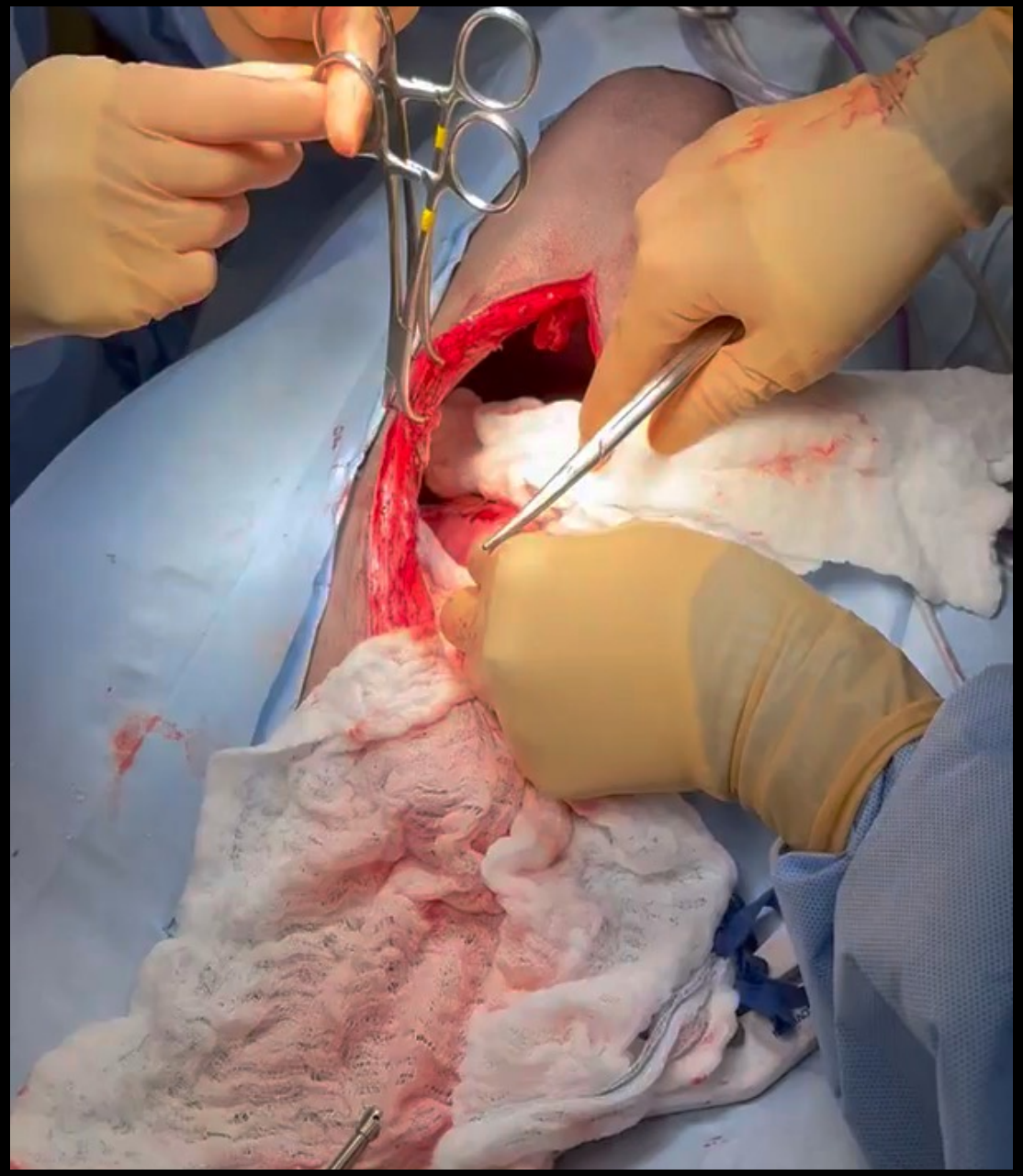
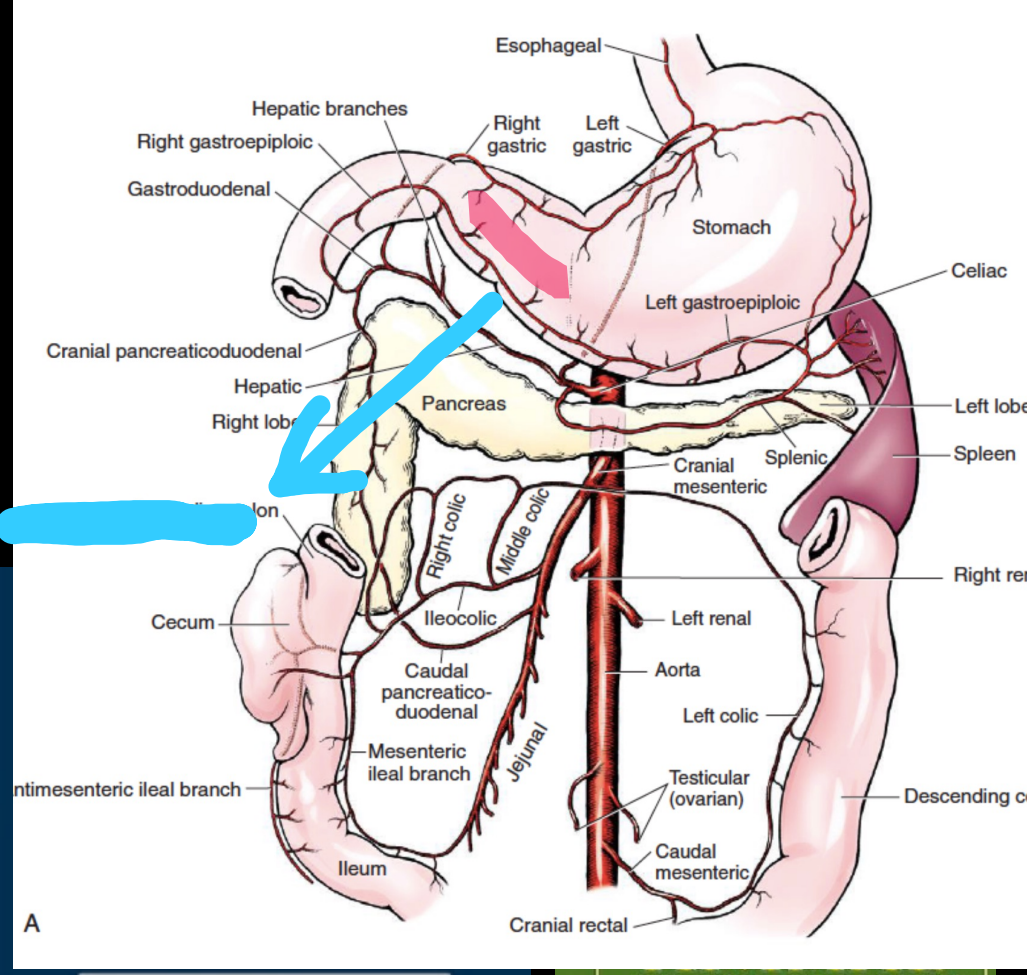
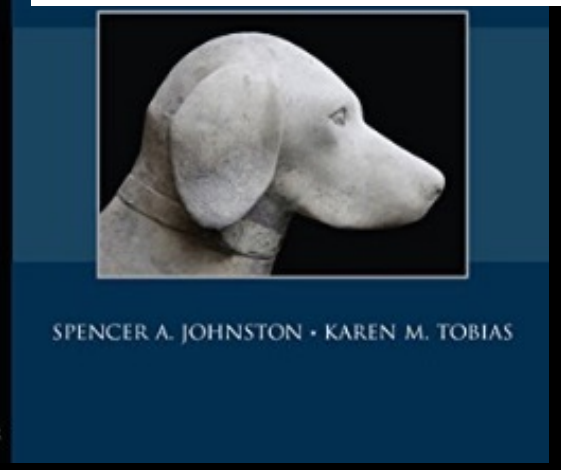


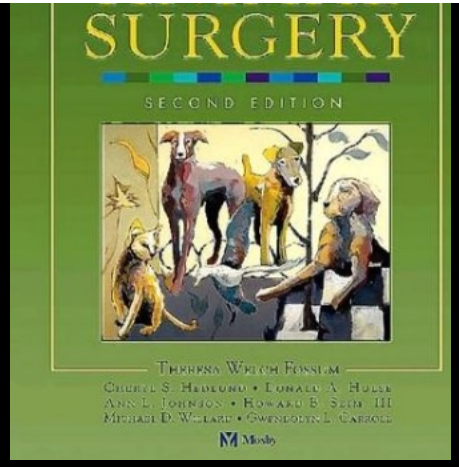


Incisional Gastropexy

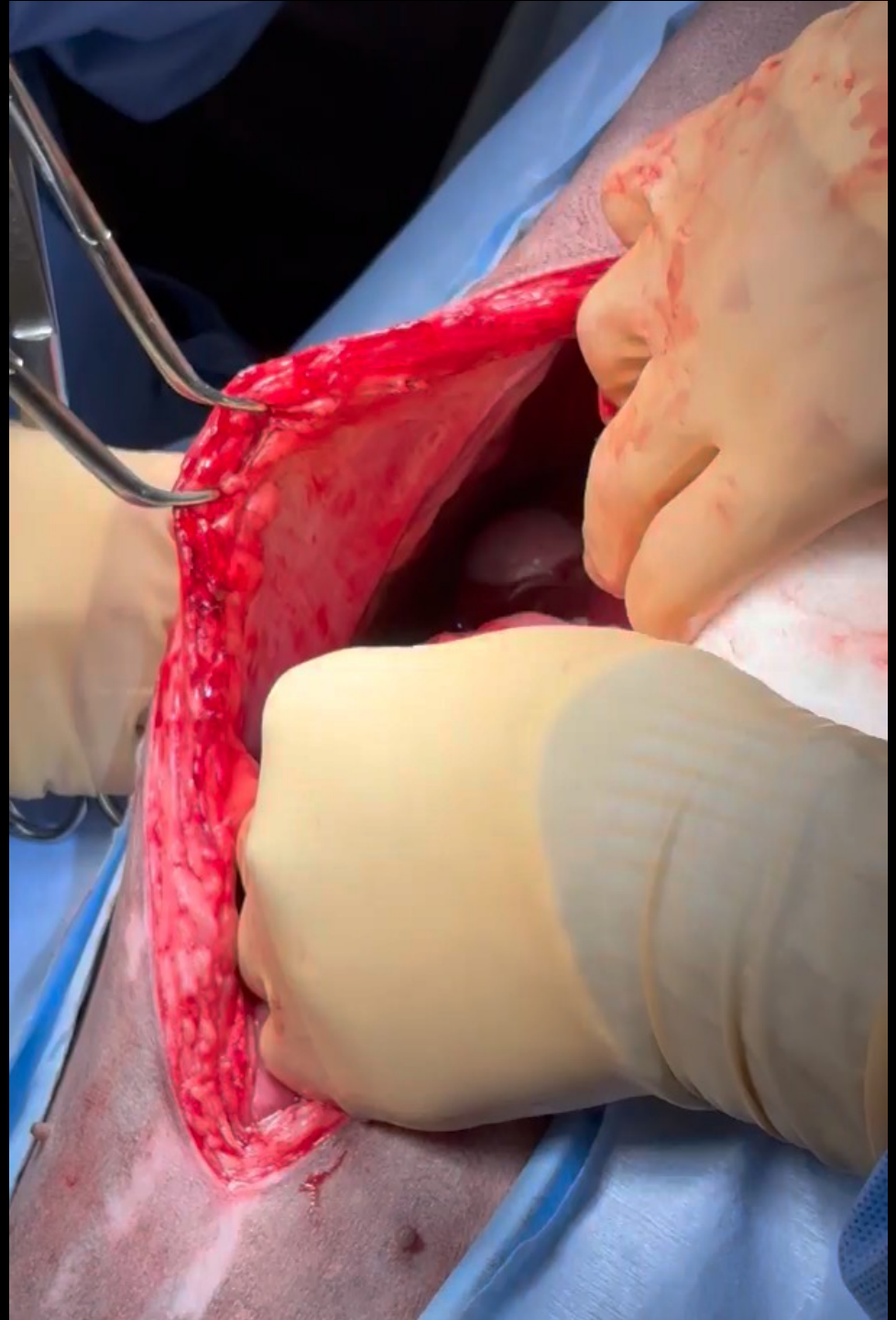
- Body wall side
  - Incision on superficial muscle
  - Caudal to the last rib on R
    - Too far away from stomach
      - In some breeds
    - Create significant tension on stomach
    - Can cause gastric outflow problem
      - Chronic GI problems
  - Now
    - I adjust it patient-patient





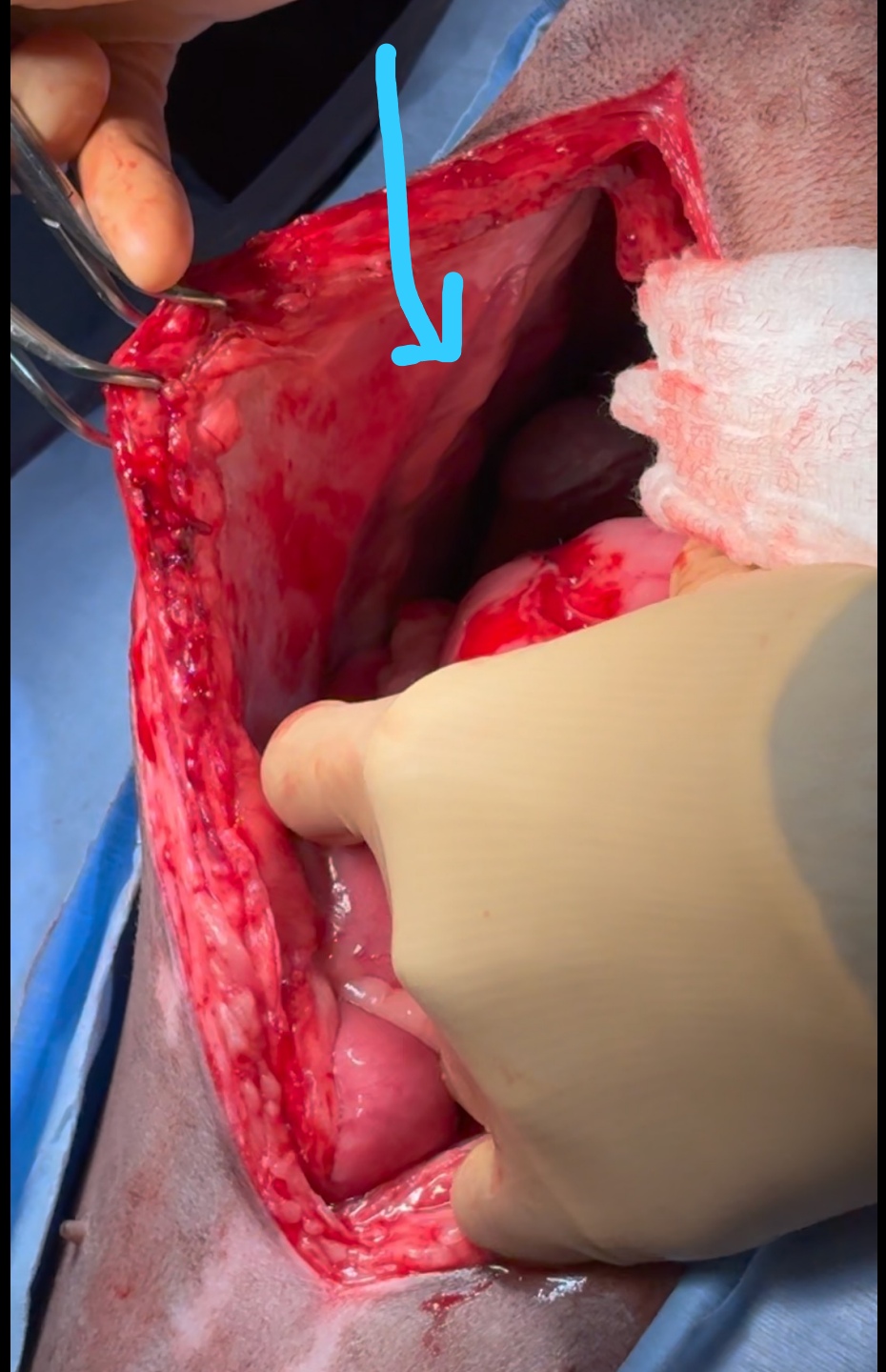


Incisional Gastropexy



Incisional Gastropexy

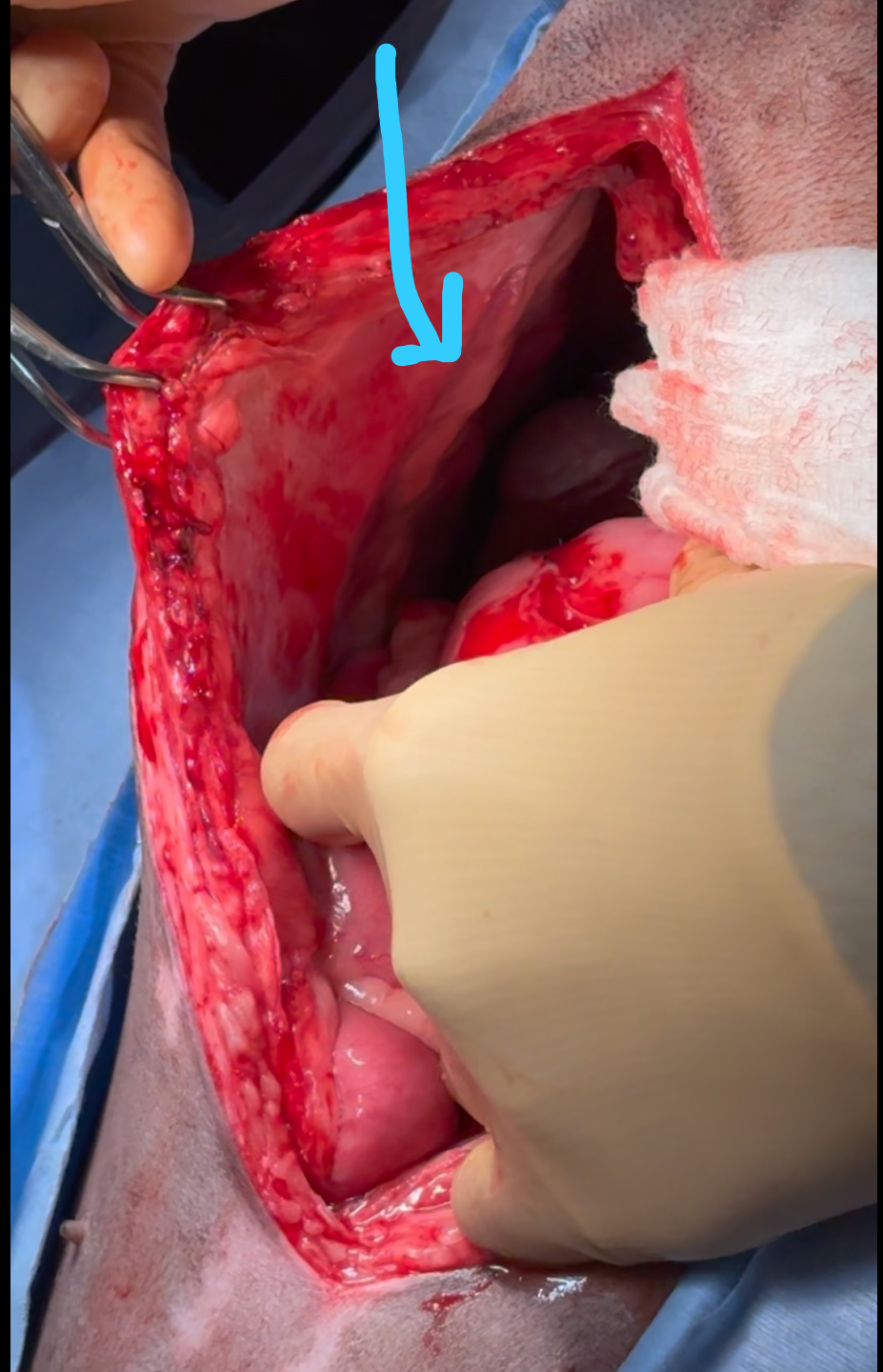
- Important points
  - Find a “white line”
    - = fat deposition on 11-12th ribs
    - Do not go cranial than this line
      - = Chest cavity
  - Use absorbable suture
    - 2-0 PDS



Complication 1

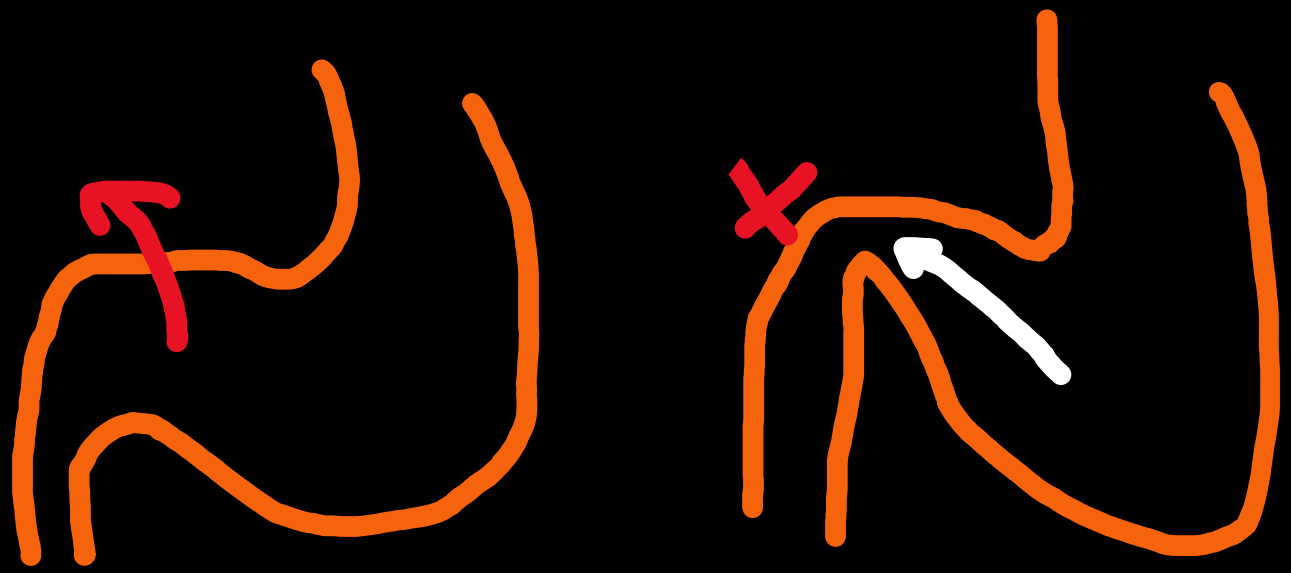
- Elective gastropexy when young
- Chronic R chest abscess
  - Numerous wound surgery
  - Response to antibiotics

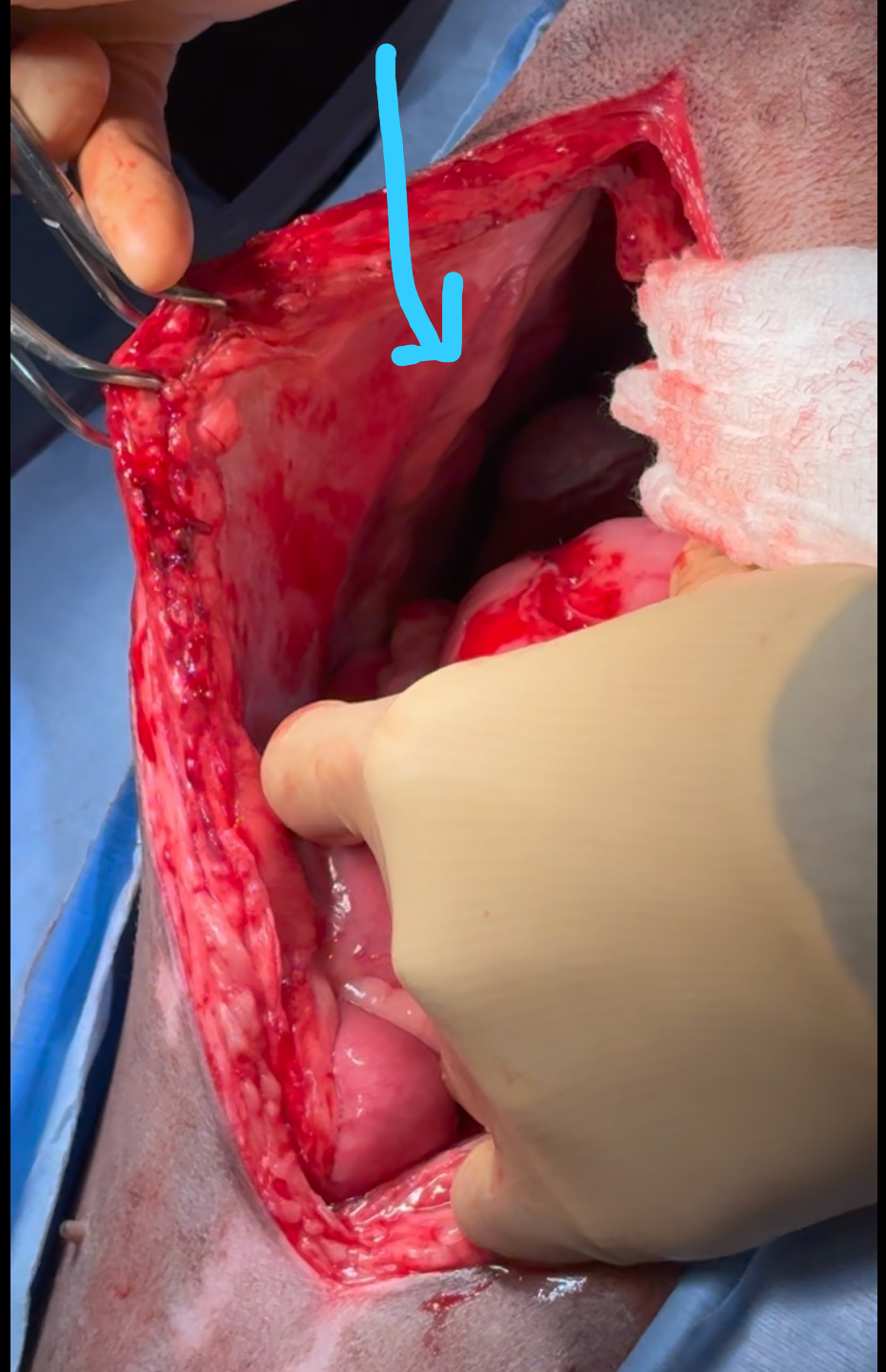
- Nylon suture used for gastropexy
  - =chronic bacterial translocation to SQ



Complication 2

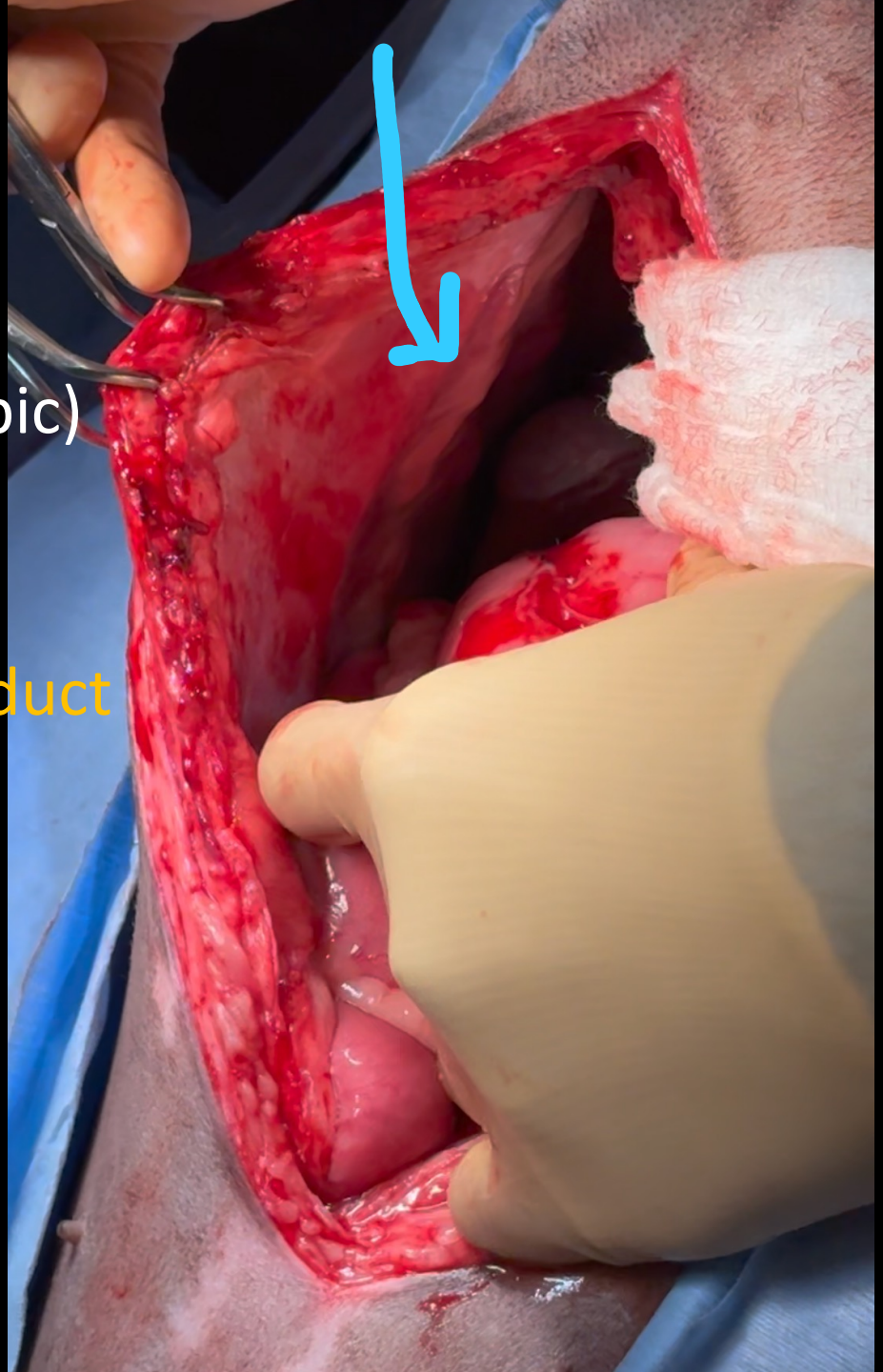
- Routine GDV + gastropexy
- Gastropexy “passed” white line
- Caused GI outflow obstruction
  - Chronic GI upset





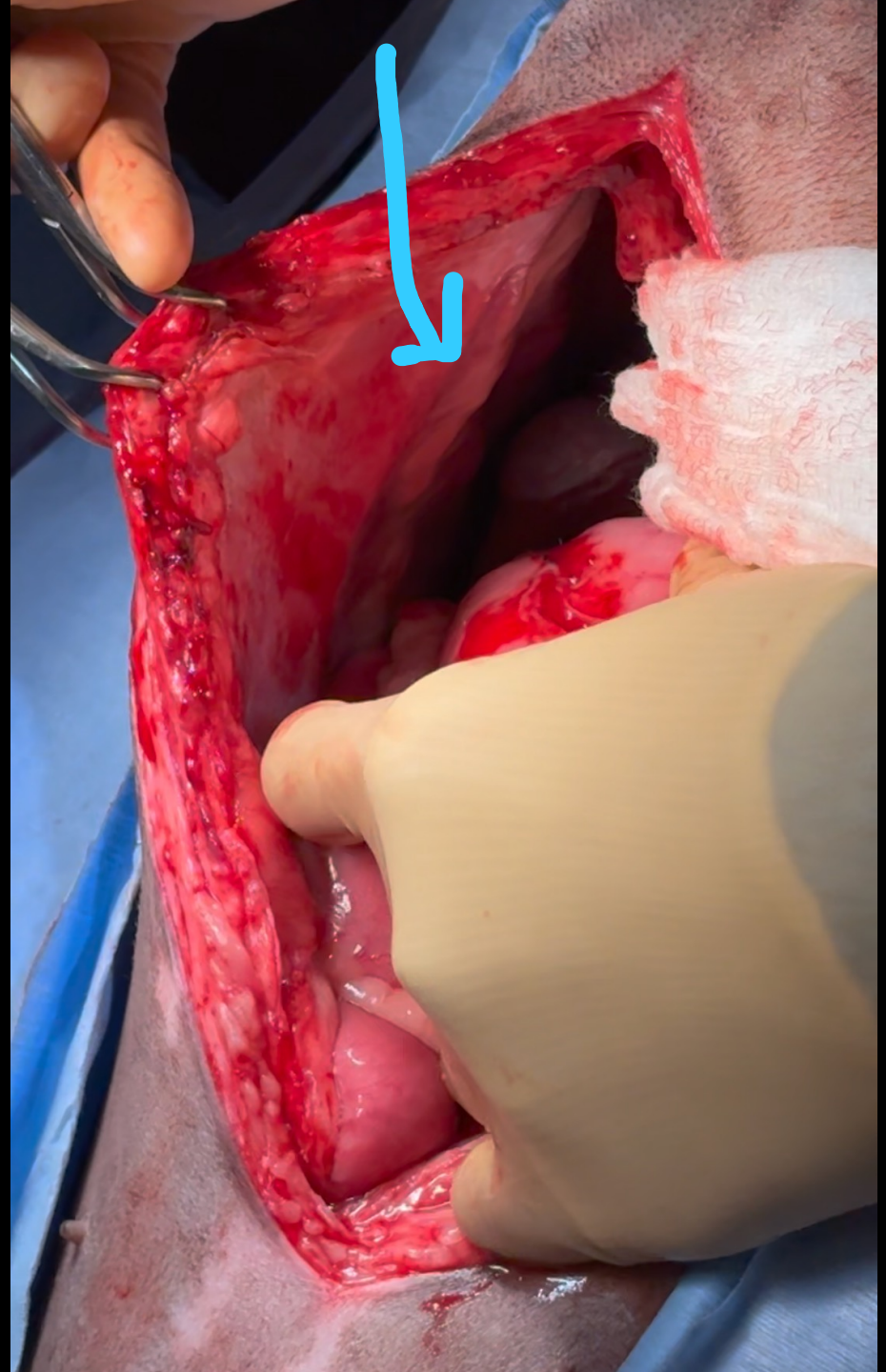
Complication 3

- Routine elective gastropexy (laparoscopic)
- Followed textbook
  - Caudal to 13th rib
- Excessive tension on stomach and bile duct
- Developed Jaundice



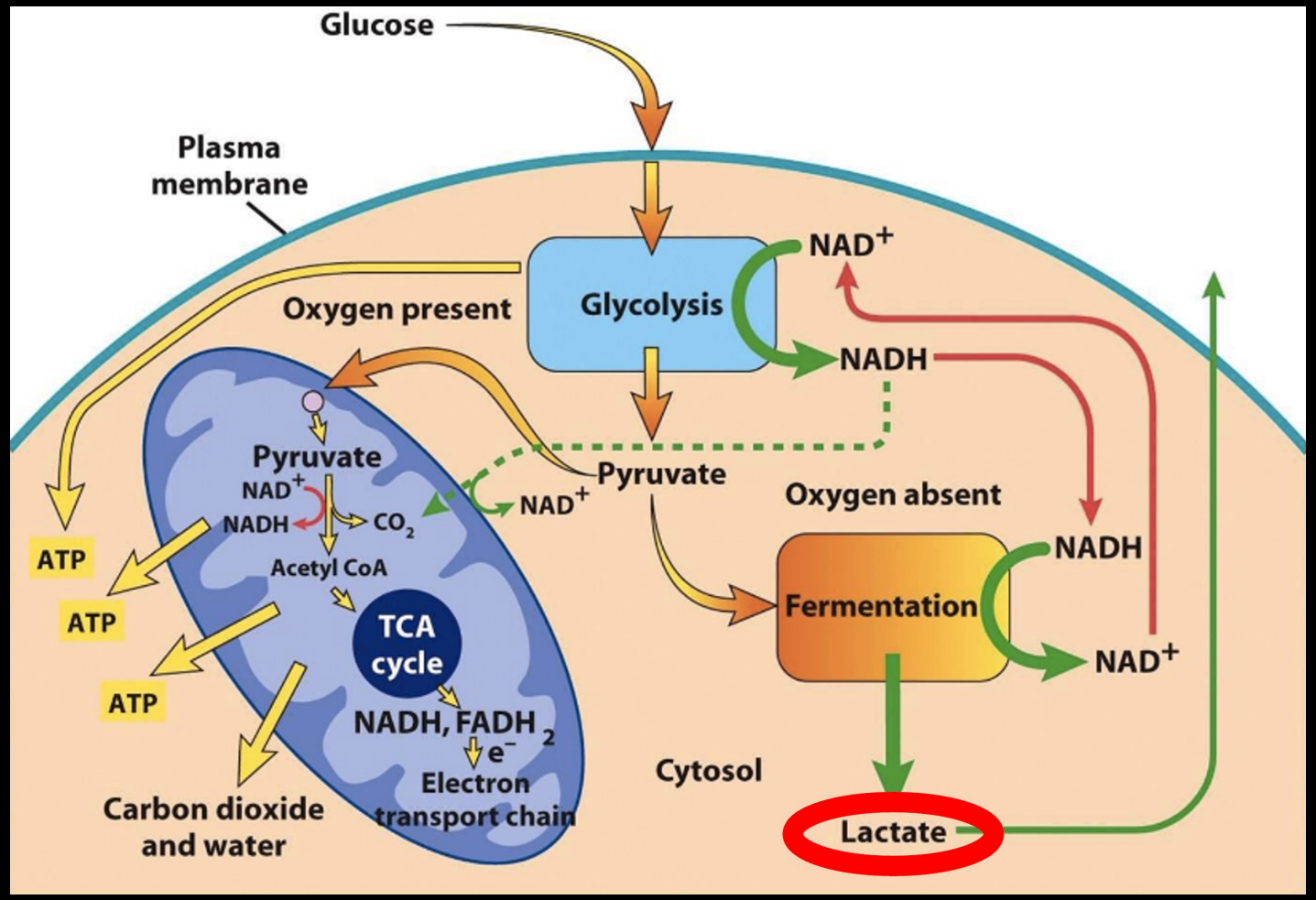
Complication 4

- Routine elective gastropexy
- A surgeon ”passed white-line”
- Incision on diaphragm
  - Went to chest
  - Cut lung….
- The surgeon got panicked
- Closed the incised diaphragm
- Tension pneumothorax



Prognosis

- Typically good
- Lactate is good indicator
  - High lactate = Bad perfusion
  - Measure twice
    - On presentation
    - After stabilization
      - IV fluid bolus
      - Decompression
      - Before surgery



Survival rates after initial stabilization (*Zacher et al, JAVMA 2010)*

- Final lactate
  - > 6.4 mmol/L (23%)
  - ≤ 6.4 mmol/L (91%)
- Absolute change in lactate concentration
  - ≤ 4 mmol/L (10%)
  - > 4 mmol/L (86%)
- % change in lactate
  - ≤ 42.5%, (15% survived)
  - > 42.5% (100% survived)

If high lactate goes low with IV fluid + decompression

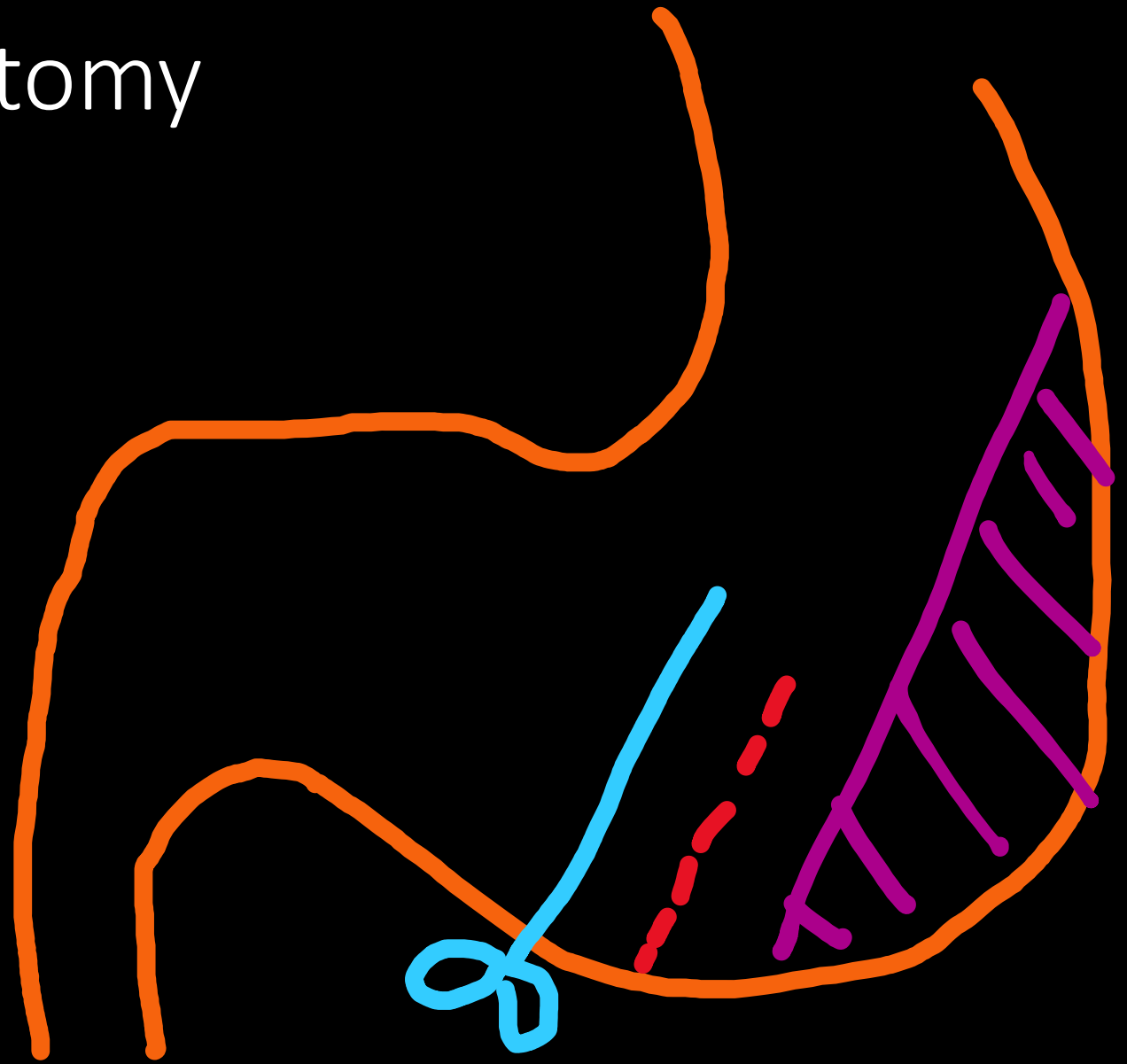
= Good prognosis

Gastric Necrosis

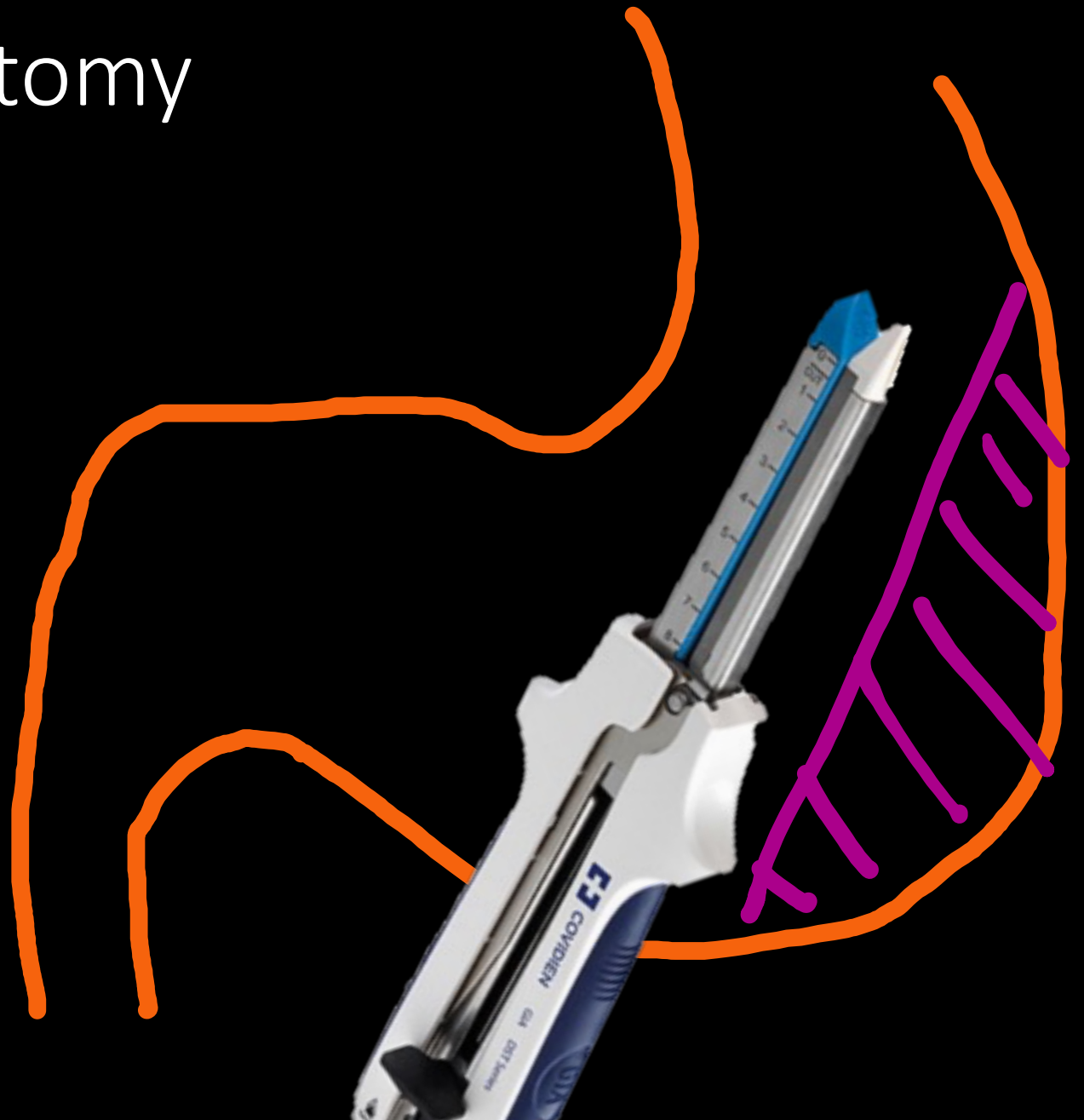
- High lactate
  - = > 6 mmol/L
  - = chance of gastric necrosis
- Stomach
  - Gastric fundus
  - Thin, dark and pale ischemia

Aydin, Ibrahim, Ahmet Pergel, Ahmet Fikret Yucel, Dursun Ali Şahin and Ender Ozer. “Gastric Necrosis due to Acute Massive Gastric Dilatation.” *Case Reports in Medicine* 2013 (2013): n. pag.

Partial Gastrectomy

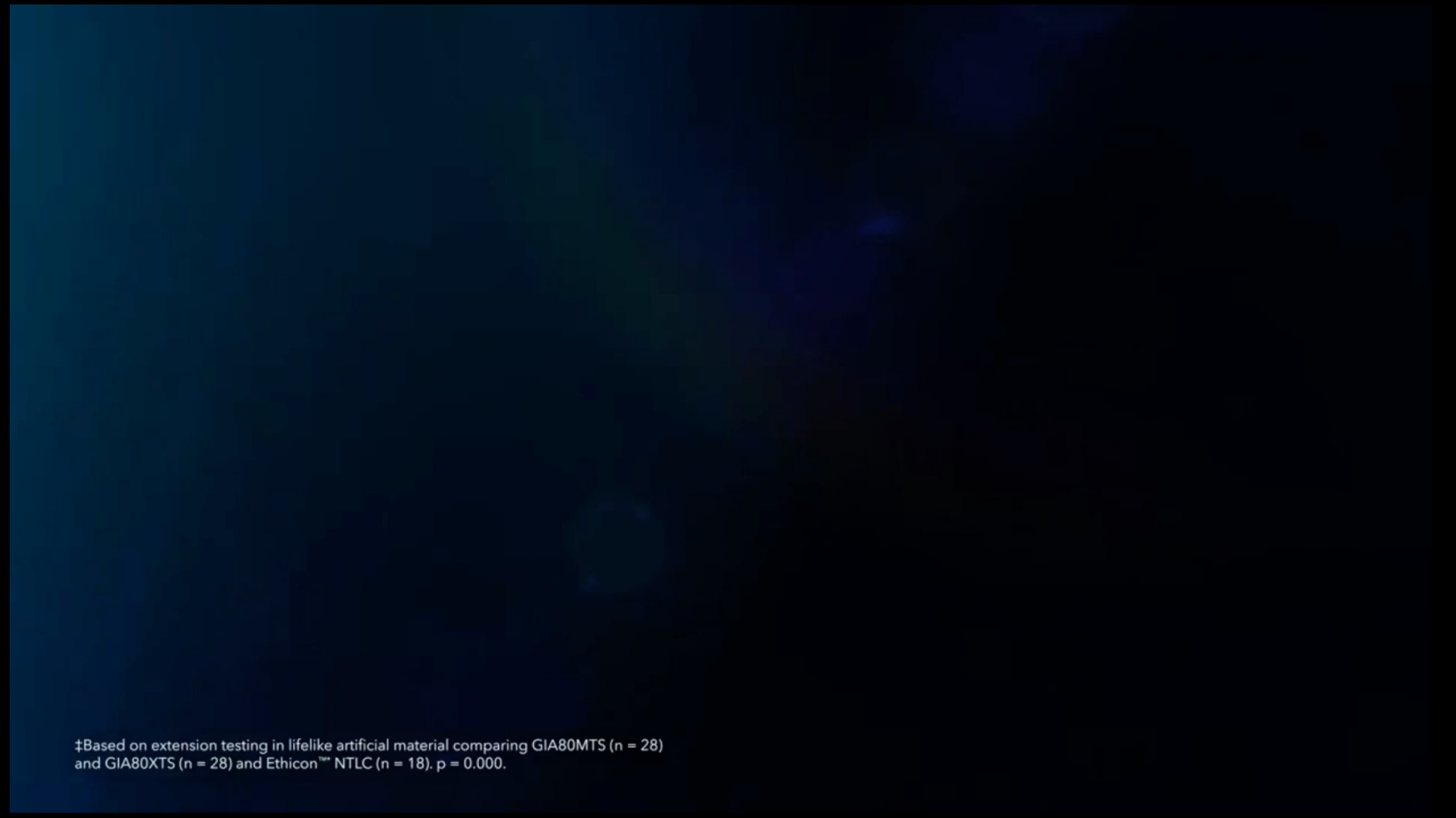


Partial Gastrectomy



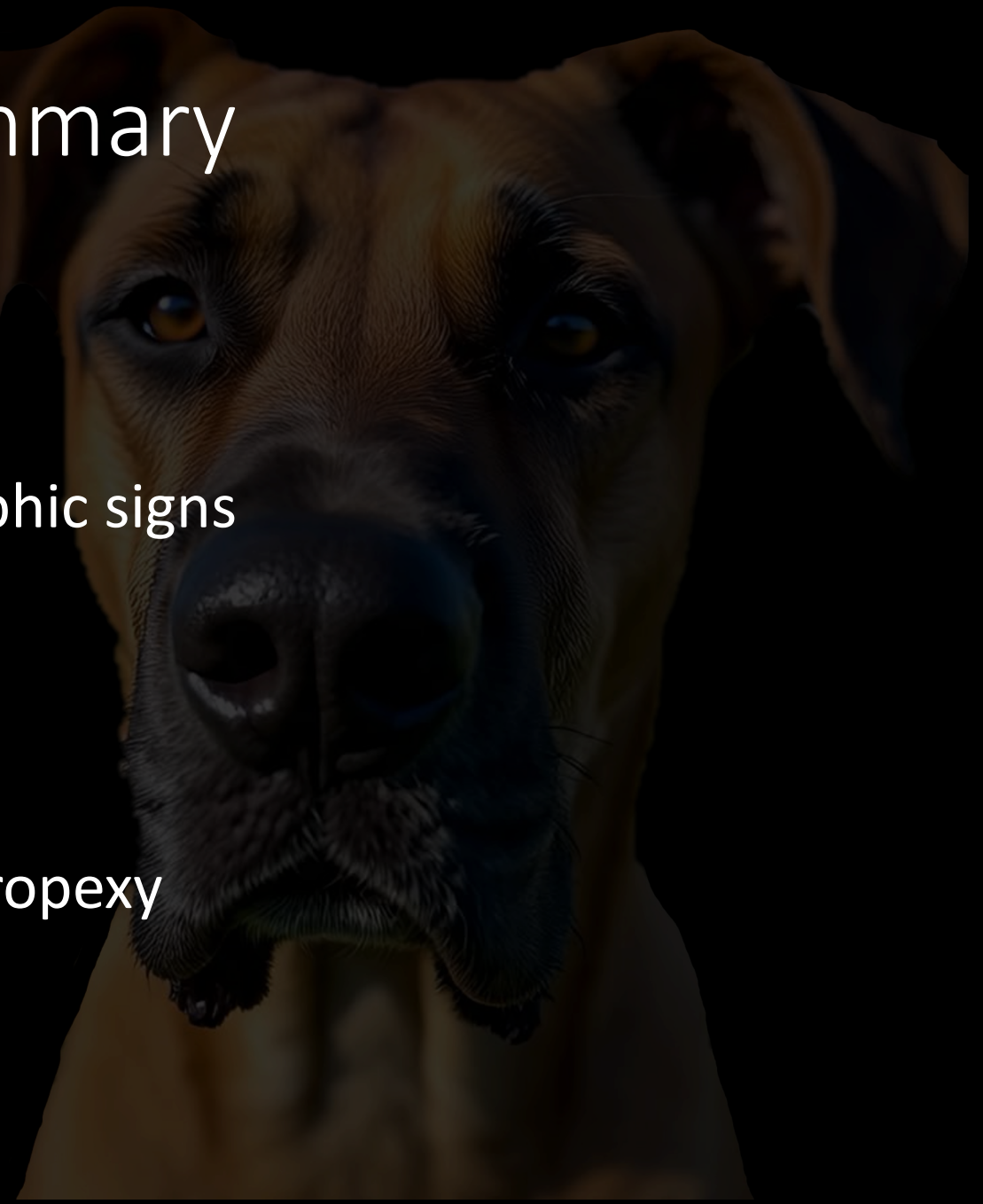
Linear GIA Staple

Linear GIA

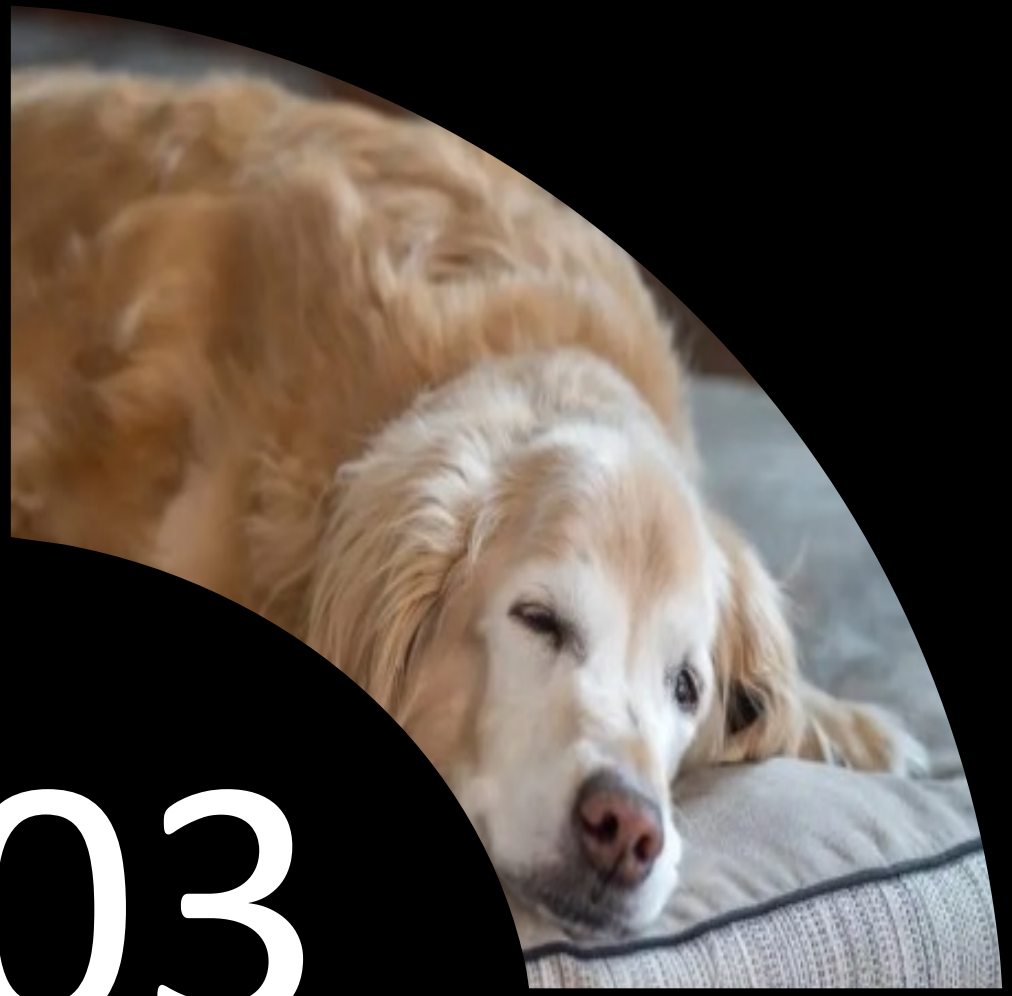


https://www.google.com/search?sca_esv=17122c3ceb4eeb09&udm=7&fbs=AIIjpHxU7SXXniUZfeShr2fp4giZ1Y6MJ25_tmWITc7uy4KIeioyp3OhN11EY0n5qfq-zENyQuF3_WaPI4Qgb6AZzy-etFjo9fqZ_m1LmwOk0Tw7NlugVBqJ2aYQkP3knYTQiMAm7VMYCShUYFAjfab01LRPu7T6r7JLyXh4g10wM4MIuhgmcw9MWBeBQodDsJvoIkm6a8gjQ8MCeXyHrPcd-p2hF-AVnA&q=covidien+linear+GIA&sa=X&ved=2ahUKEwjgzdT0ldSQAxX0yOYEHcQTPVQQtKgLegQIFRAB&biw=1871&bih=913&dpr=1#fpstate=ive&vld=cid:865c0b84,vid:6rJEslXrgU0,st:0

GDV Summary



- Check Pylorus position on X rays
- Integrate clinical signs with radiographic signs
- Deflate stomach then De-rotation
- Do not blindly use “13th rib” for gastropexy



03

- *Splenic Tumor Essentials*

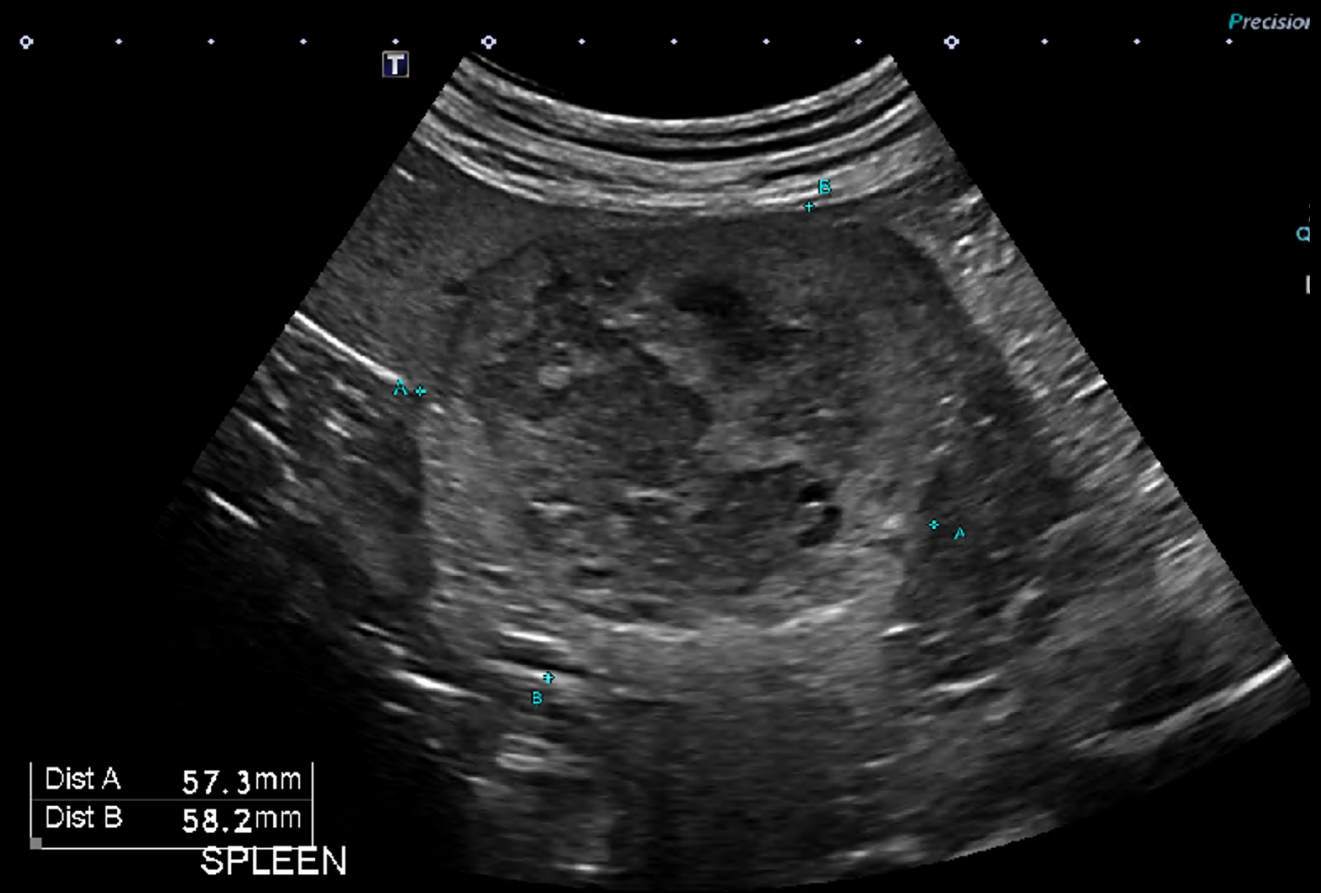
10:40 am – 11:15 am

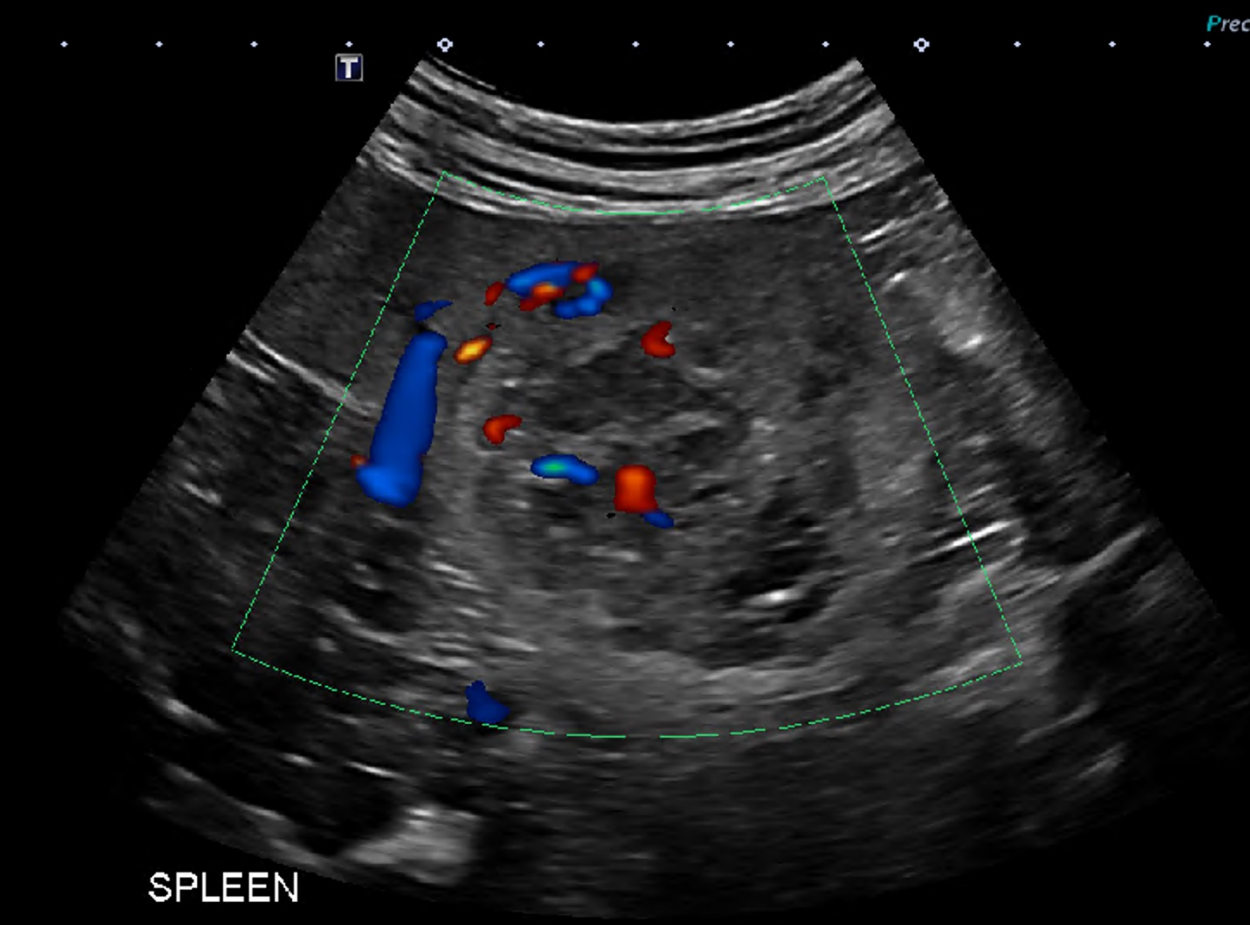
- Imaging diagnosis
- Splenectomy 101

Diagnostic imaging features of splenic lesions in dogs: when should we worry?

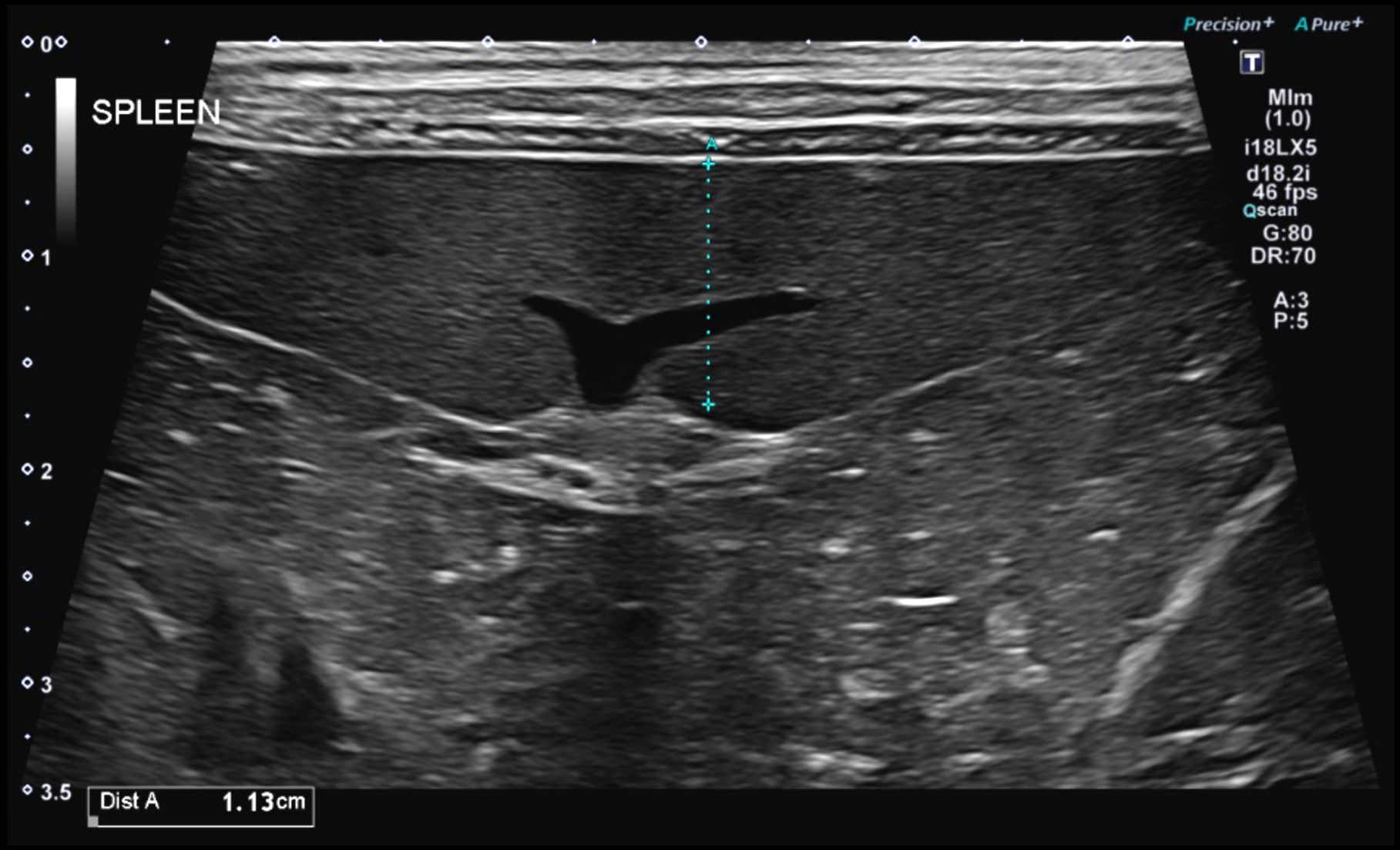
Who would be worried?

9YO, F, S, COONHOUND – Incidentally found splenic lesion

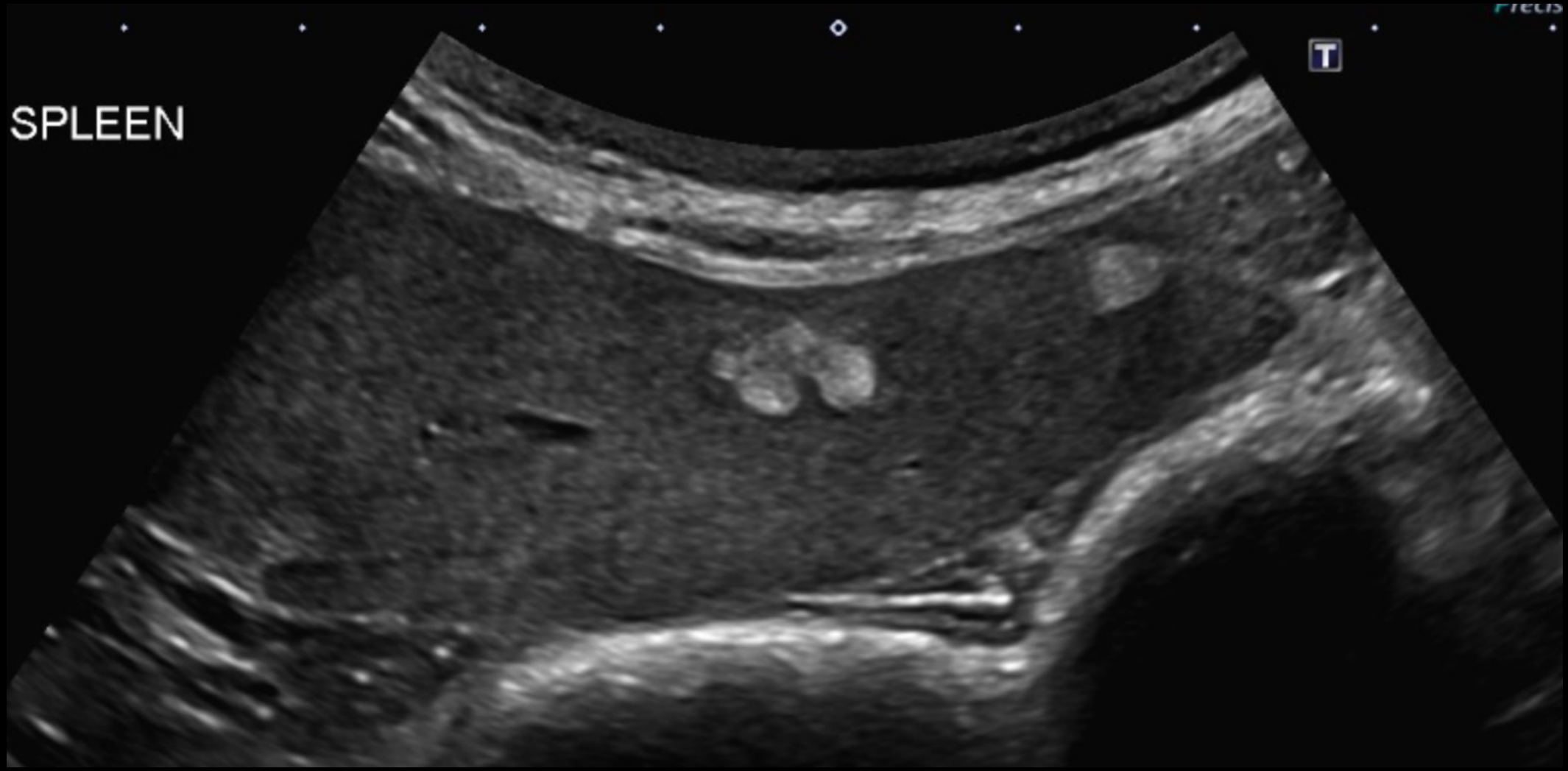




Sonographic appearance of the normal spleen

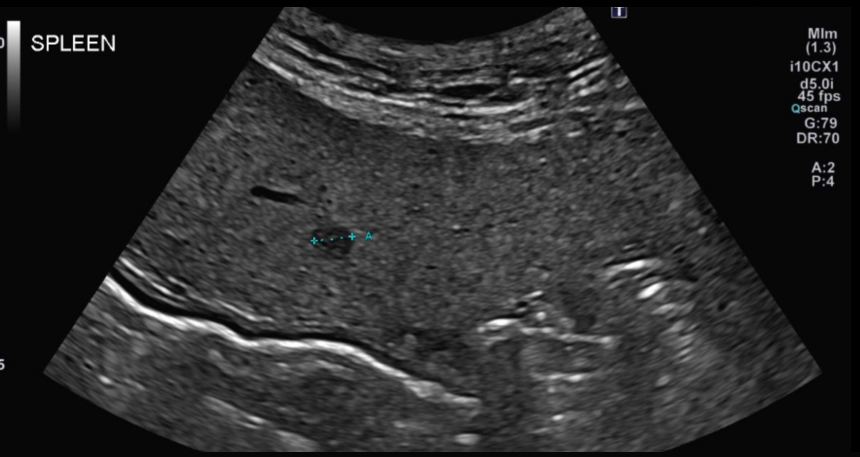


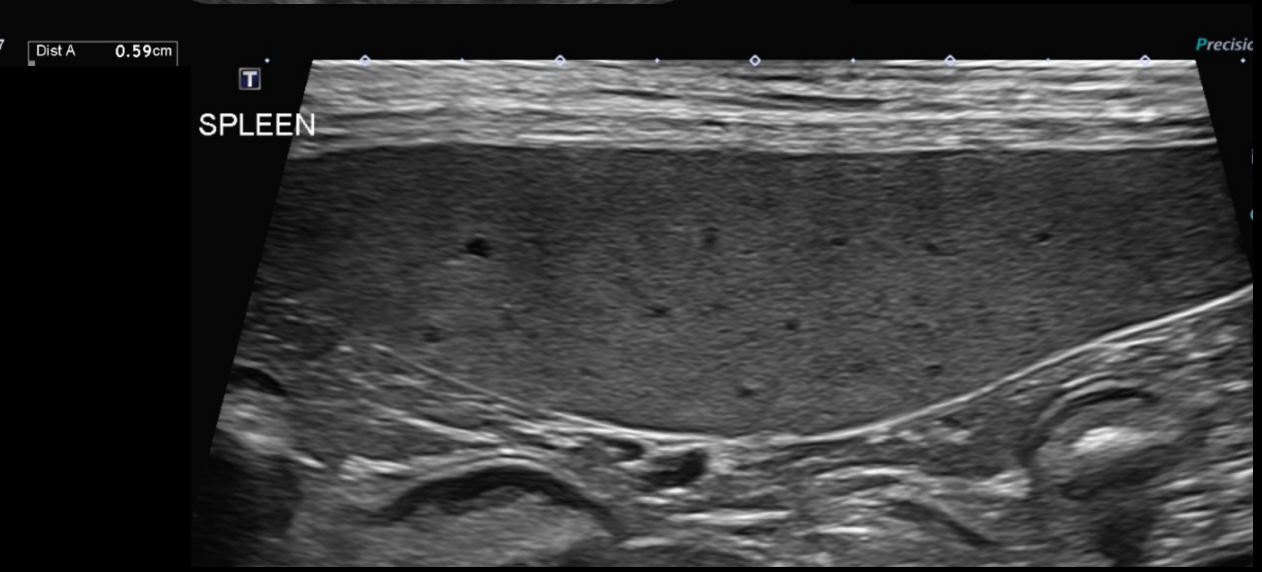
Benign splenic myelolipomas



Non-specific splenic lesions

Extramedullary hematopoiesis





Nodular hyperplasia

Then, when should we be worried?

Sonographic criteria for malignancy

Clinical relevance of splenic nodules or heterogeneous splenic parenchyma assessed by cytologic evaluation of fine-needle samples in 125 dogs (2011-2015)

Igor Yankin | Sarah Nemanic | Silvia Funes | Helio de Morais | Elena C
Craig Ruaux

Presurgical assessment of splenic tumors in dogs: a retrospective study of 57 cases (2012–2017)

Mokhyeon Lee[1,†], Jiyoung Park[1,†], Hojung Choi[2], Haebeom Lee[1], Seong Mok Jeong[1,*]

CELLULAR FEATURES OF SONOGRAPHIC TARGET LESIONS OF THE LIVER AND SPLEEN IN 21 DOGS AND A CAT

ALESSANDRA CUCCOVILLO, CHRISTOPHER R. LAMB

Correlation of ultrasonographic appearance of lesions and cytologic and histologic diagnoses in splenic aspirates from dogs and cats: 32 cases (2002–2005)

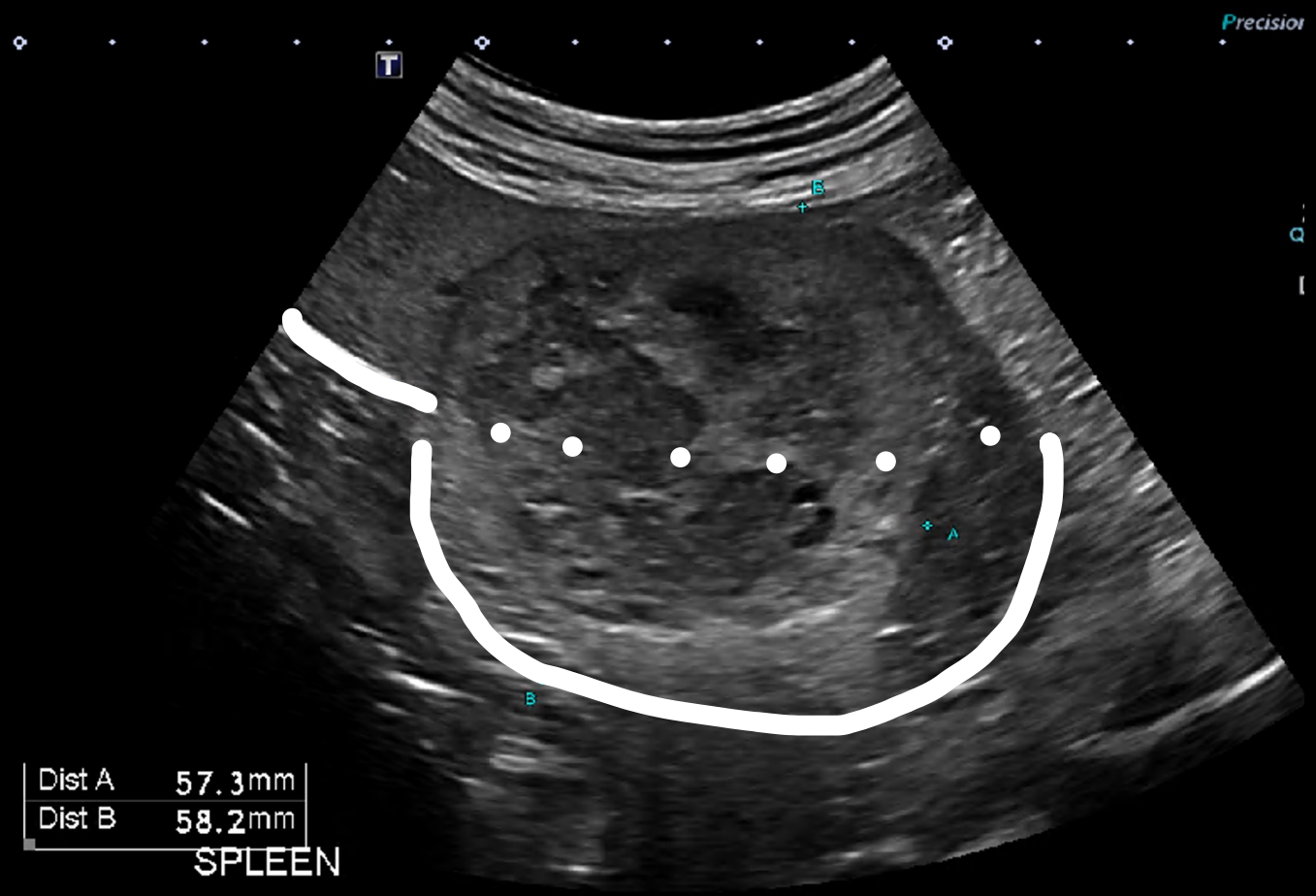
Elizabeth A. Ballegeer, DVM; Lisa J. Forrest, VMD, DACVR; Ryan M. Dickinson, DVM, DACVP; Melissa M. Schutten, DVM, DACVP; Fern A. Delaney; Karen M. Young, VMD, PhD

COLOR AND POWER DOPPLER ULTRASONOGRAPHY FOR CHARACTERIZATION OF SPLENIC MASSES IN DOGS

JENELLE L. SHARPLEY, ANGELA J. MAROLF, JEAN K. REICHLE, ANNETTE M. BACHAND, ELISSA K. RANDALL

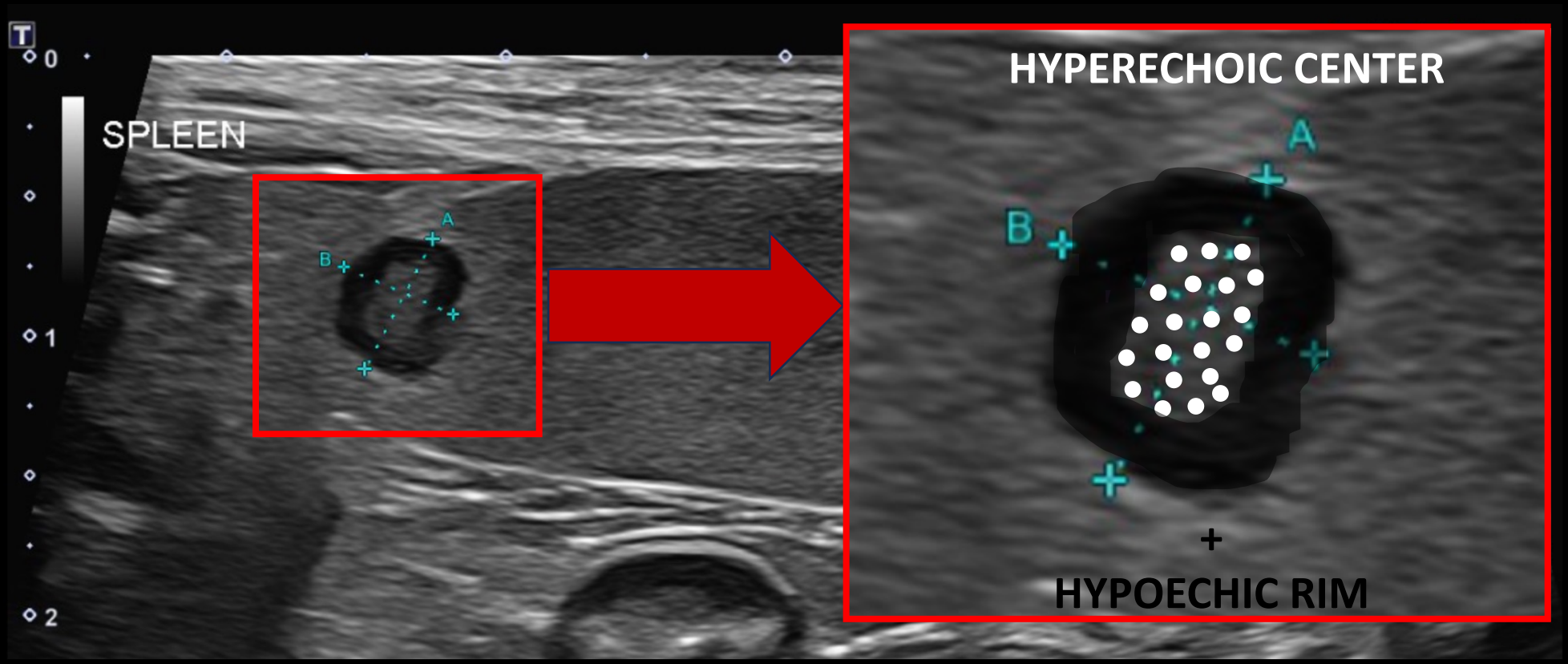
Sonographic criteria for malignancy

- Larger size and capsular distortion



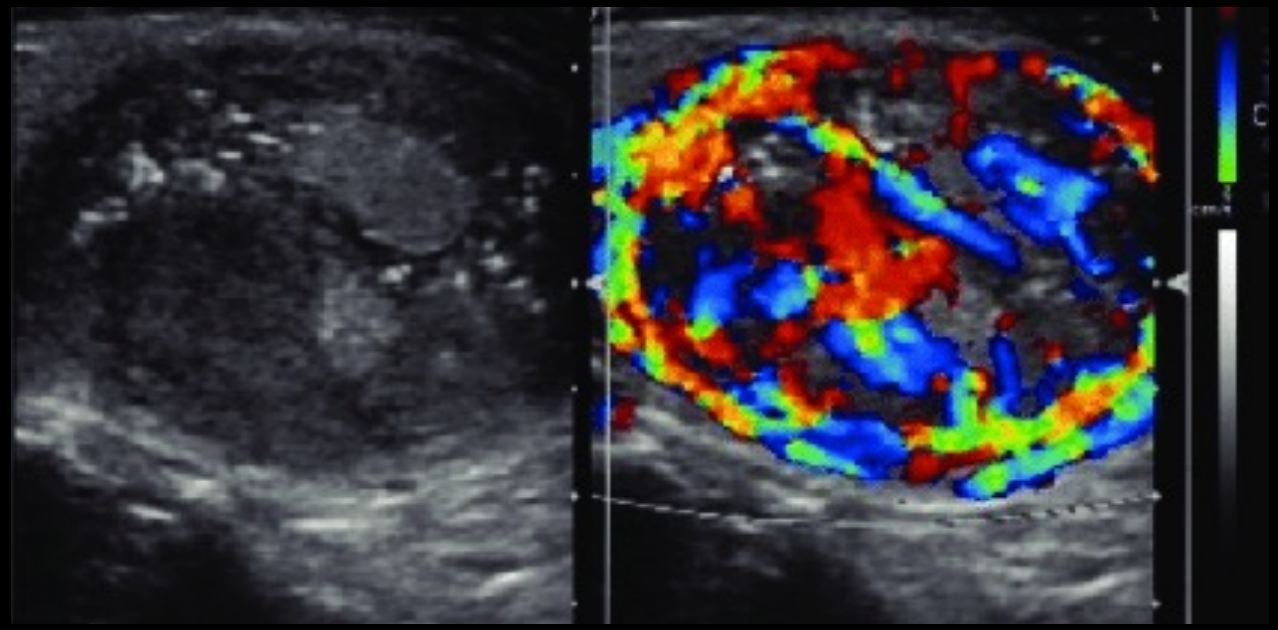
Sonographic criteria for malignancy

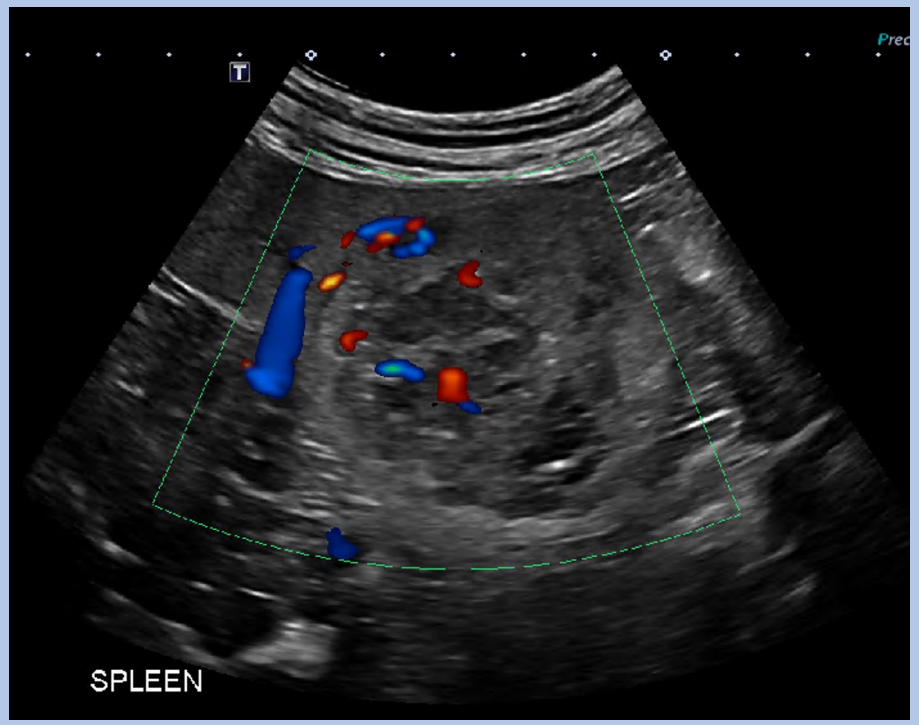
- Target appearance



Sonographic criteria for malignancy

- Aberrant vessels or distortion of the splenic vessel on color or power Doppler

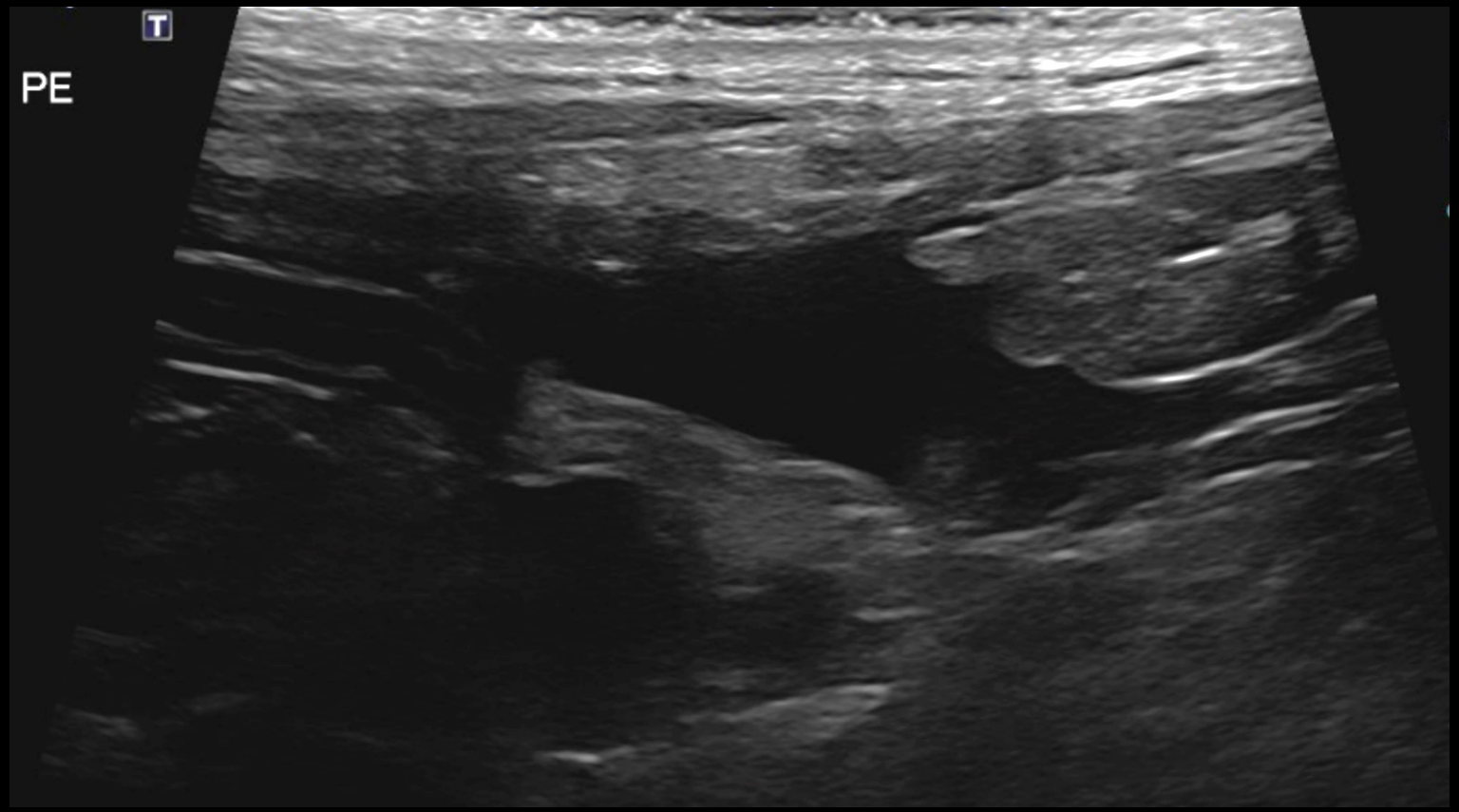




NO ABERRANT VESSELS

Sonographic criteria for malignancy

- **Peritoneal effusion**



Sonographic criteria for malignancy

- **Peritoneal effusion**

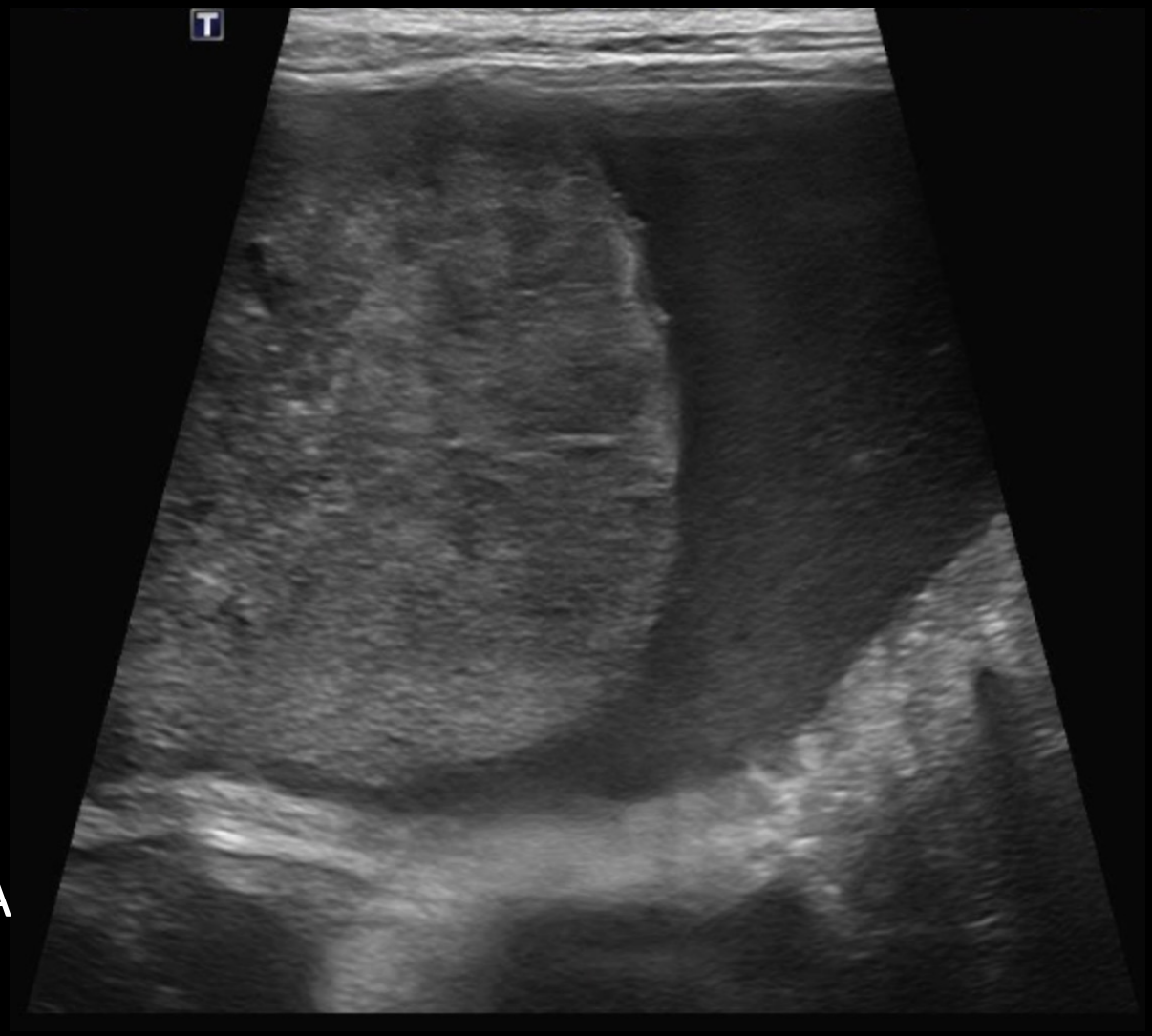
HEMOABDOMEN

↓

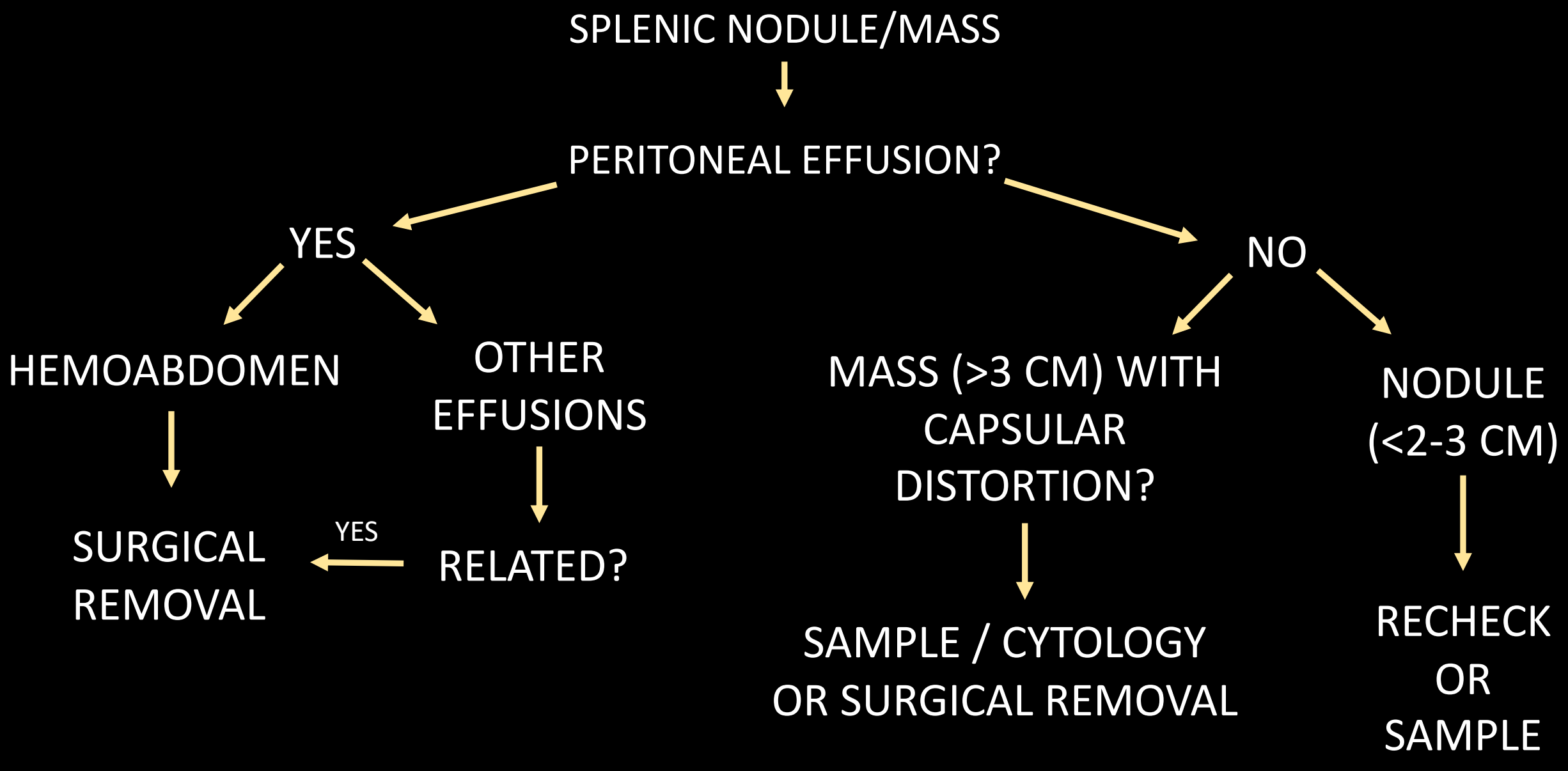
DOUBLE 2/3 RULE

↓

- 2/3 SPLENIC MASSES = MALIGNANT
- 2/3 OF MALIGNANCIES = HEMANGIOSARCOMA



My Personal Flow Chart to Determine Clinical Relevance



Sampling

Computed Tomography of the spleen

Normal spleen

PRE-CONTRAST

POST-CONTRAST

Computed Tomography criteria for malignancy

COMPARISON BETWEEN MALIGNANT AND NONMALIGNANT SPLENIC MASSES IN DOGS USING CONTRAST-ENHANCED COMPUTED TOMOGRAPHY

Wendy D. Fife, DVM, MS, Valerie F. Samii, DVM, Wm Tod Drost, DVM, John S. Mattoon, DVM, Stacy Hoshaw-Woodard, PhD

CT PROVIDED LIMITED INFORMATION FOR DISTINCTION BETWEEN MALIGNANT AND BENIGN LESIONS

ASSOCIATIONS BETWEEN DUAL-PHASE COMPUTED TOMOGRAPHY FEATURES AND HISTOPATHOLOGIC DIAGNOSES IN 52 DOGS WITH HEPATIC OR SPLENIC MASSES

Ian D. Jones, Christopher R. Lamb, Randi Drees, Simon L. Priestnall, Panagiotis Mantis

Triple-phase helical computed tomography in dogs with solid splenic masses

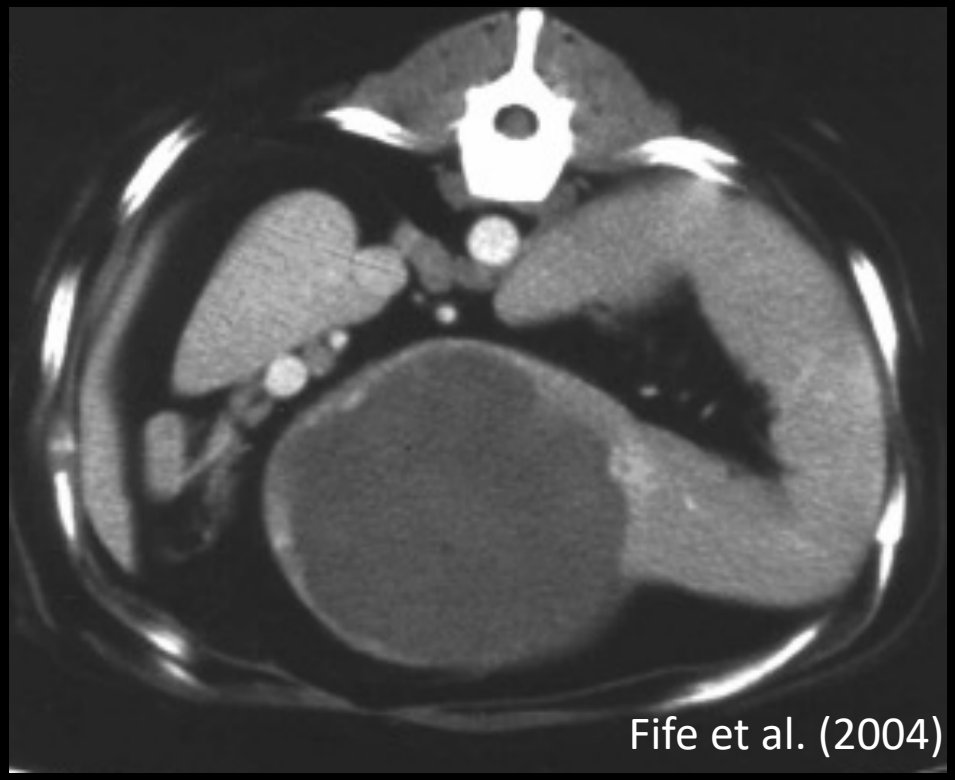
Kenji KUTARA[1)], Mamiko SEKI[1)], Kumiko ISHIGAKI[1)], Kenji TESHIMA[1)], Chieko ISHIKAWA[1)], Yumiko KAGAWA[2)], Kazuya EDAMURA[1)], Tomohiro NAKAYAMA[1)] and Kazushi ASANO[1)]*

Computed Tomography criteria for malignancy

- **Lower attenuation values (pre- and post-contrast)**

PRE-CONTRAST

POST-CONTRAST

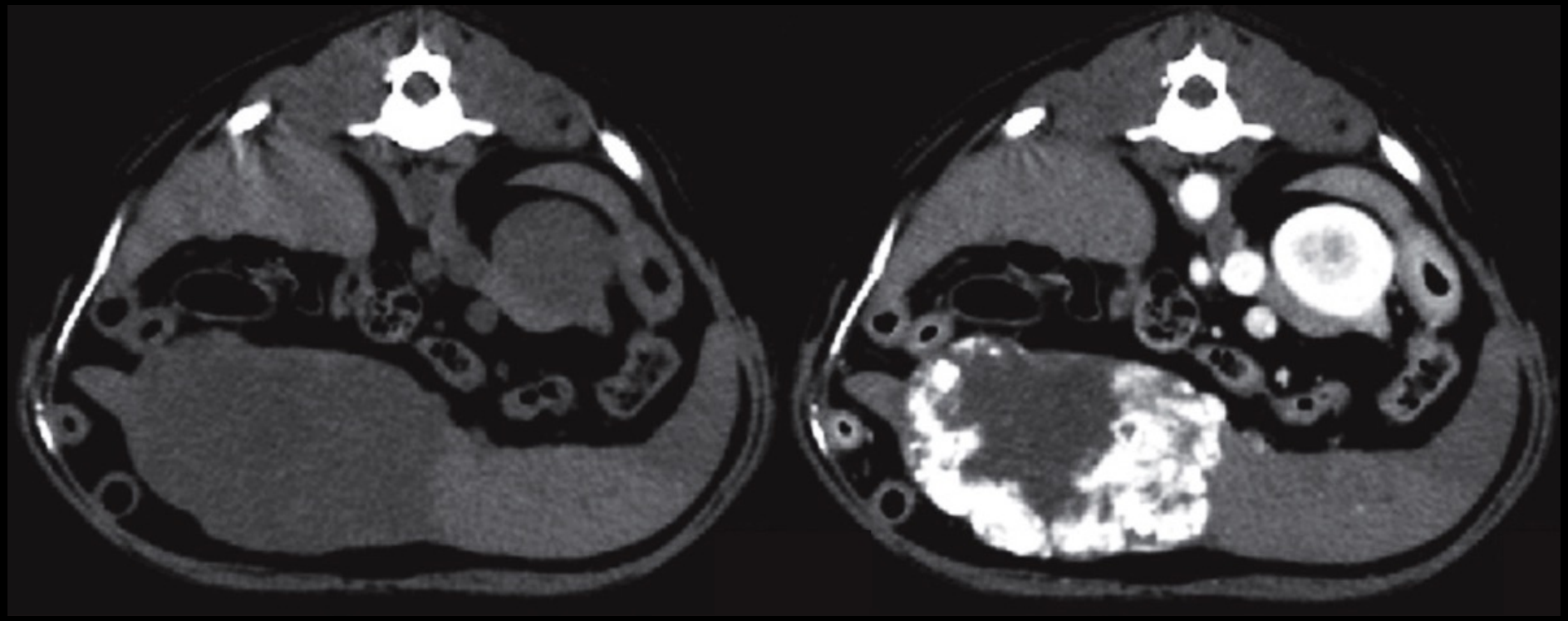


Fife et al. (2004)

Computed Tomography criteria for malignancy

- **Marked and heterogeneous contrast enhancement**

PRE-CONTRAST POST-CONTRAST

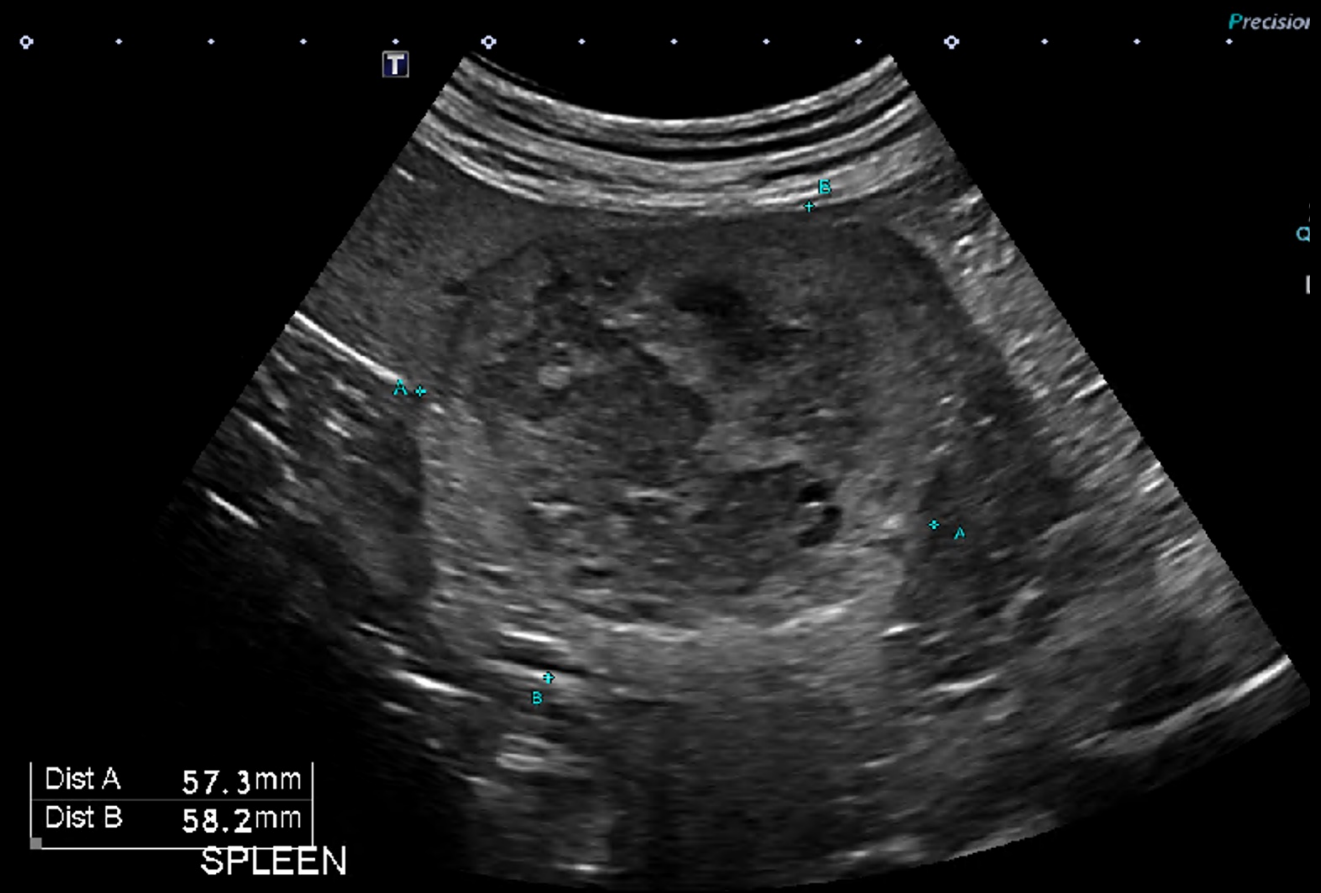


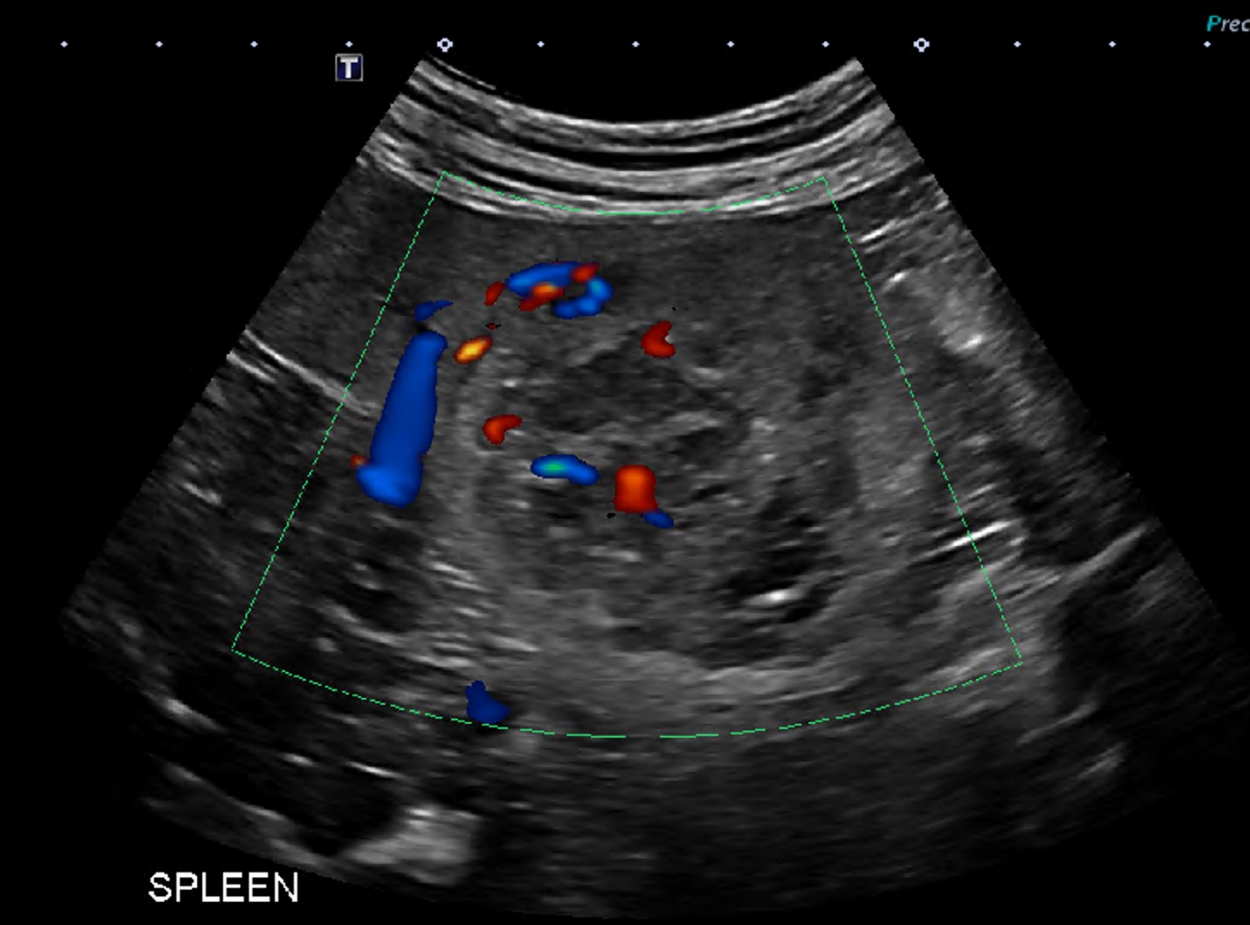
Kutara et al. (2017)

CT – Ruptured splenic hemangiosarcoma

Who would be worried?

9YO, F, S, COONHOUND – Incidentally found splenic lesion





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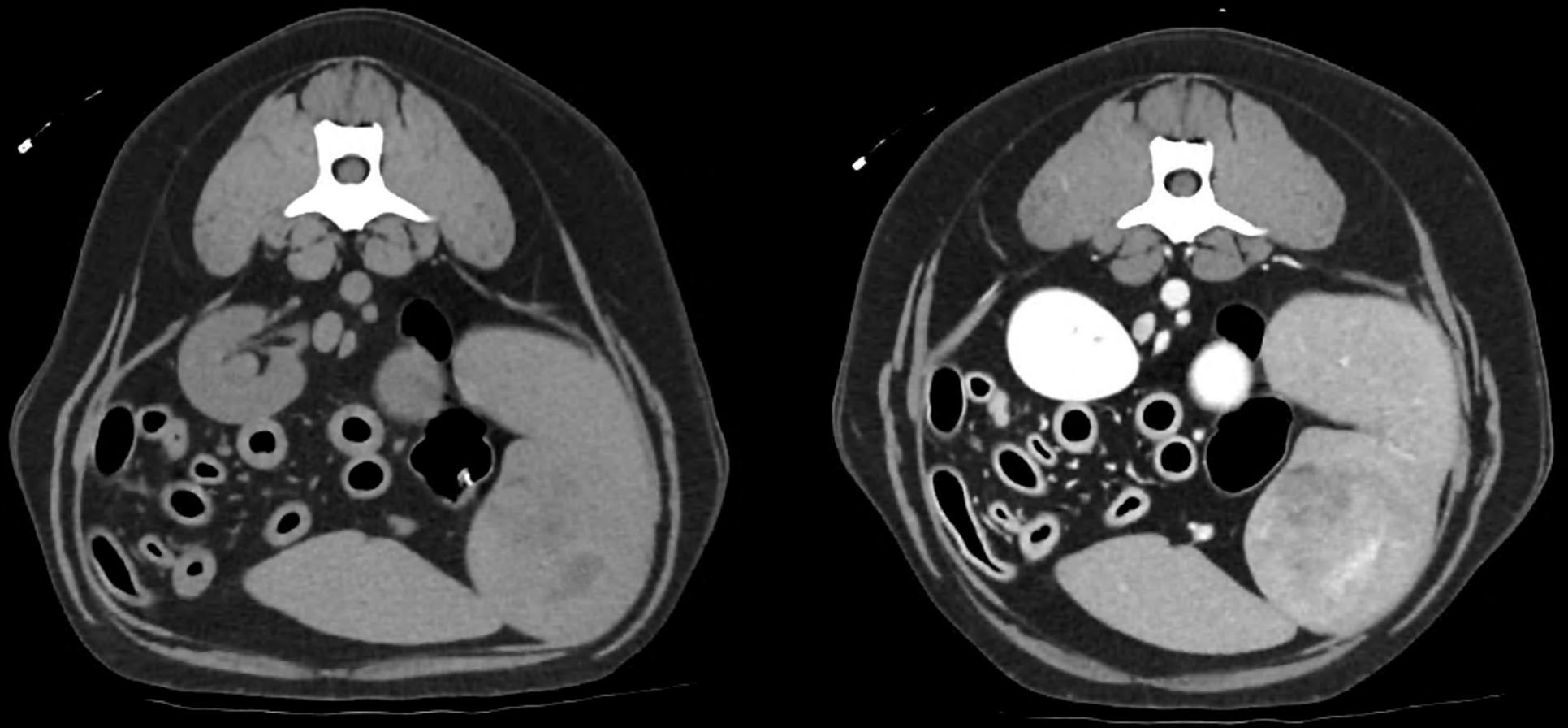
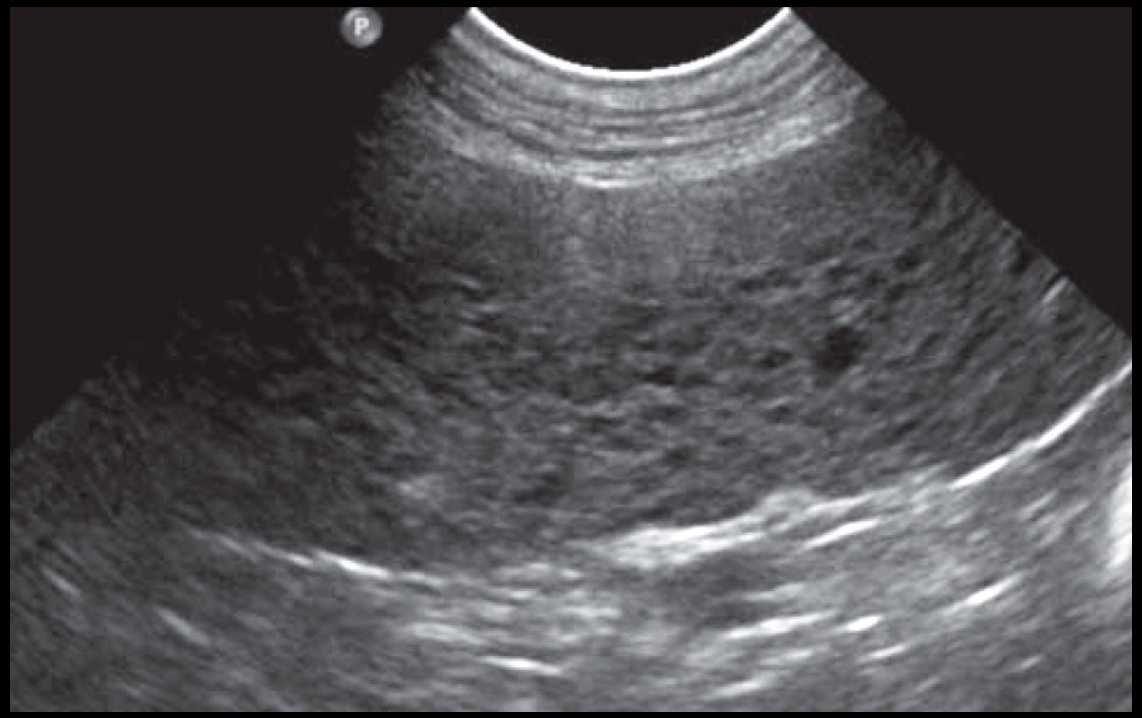
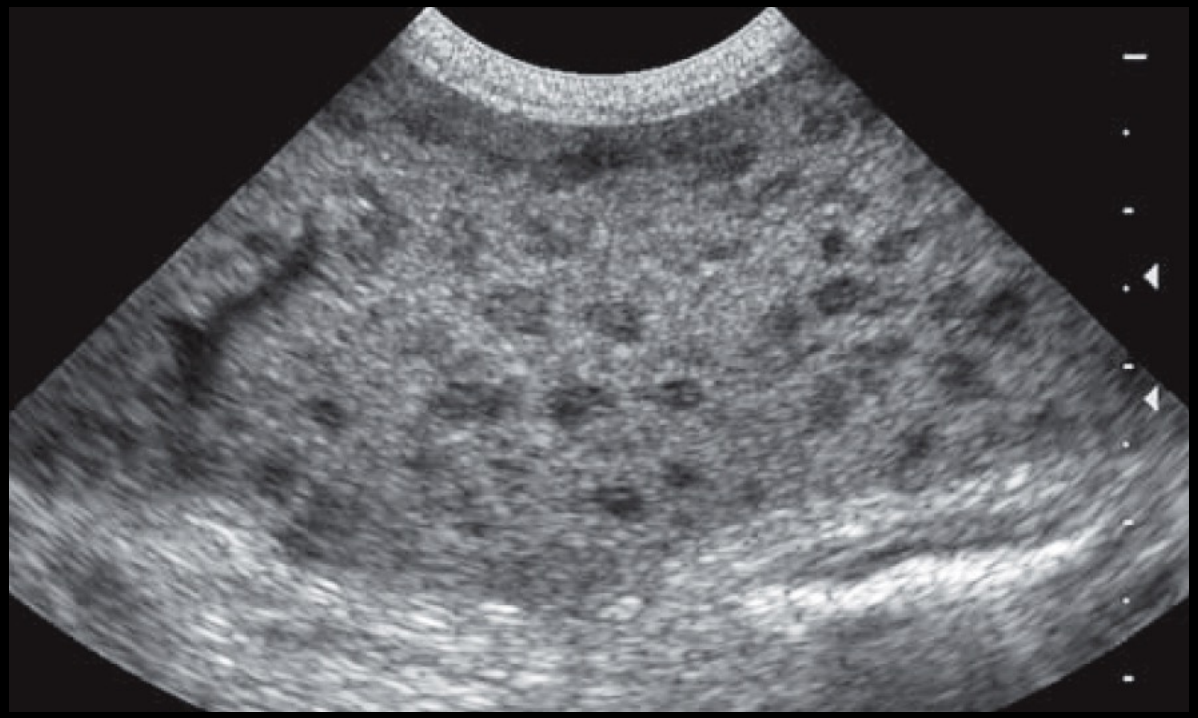


Other splenic malignancies

- Round cell infiltration
  - Lymphoma





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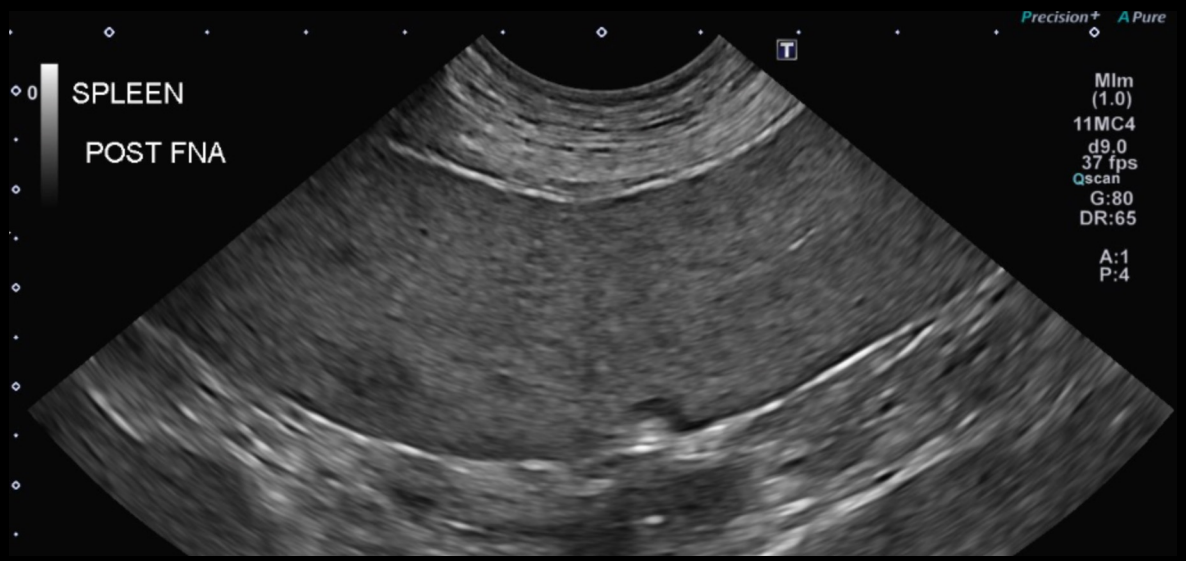
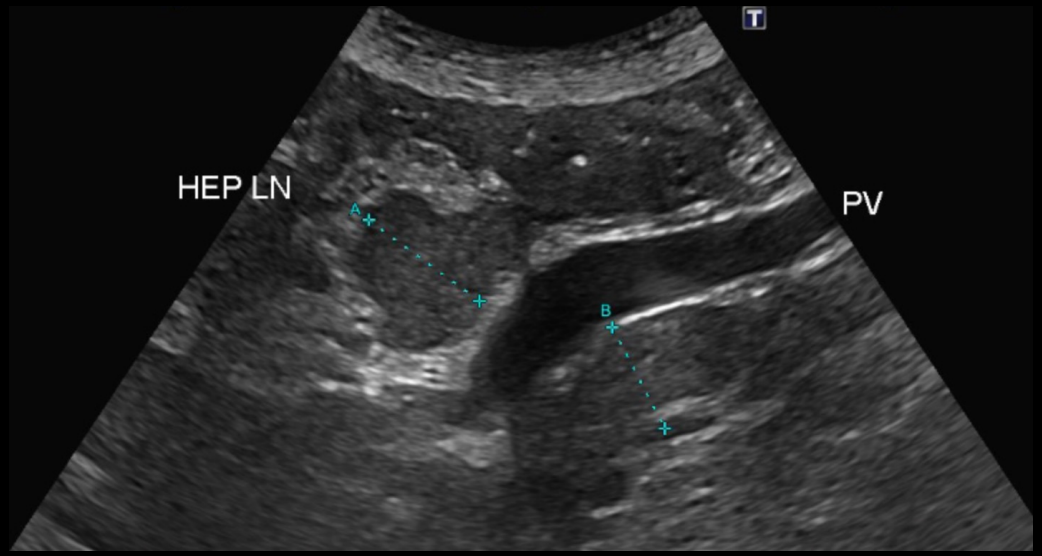




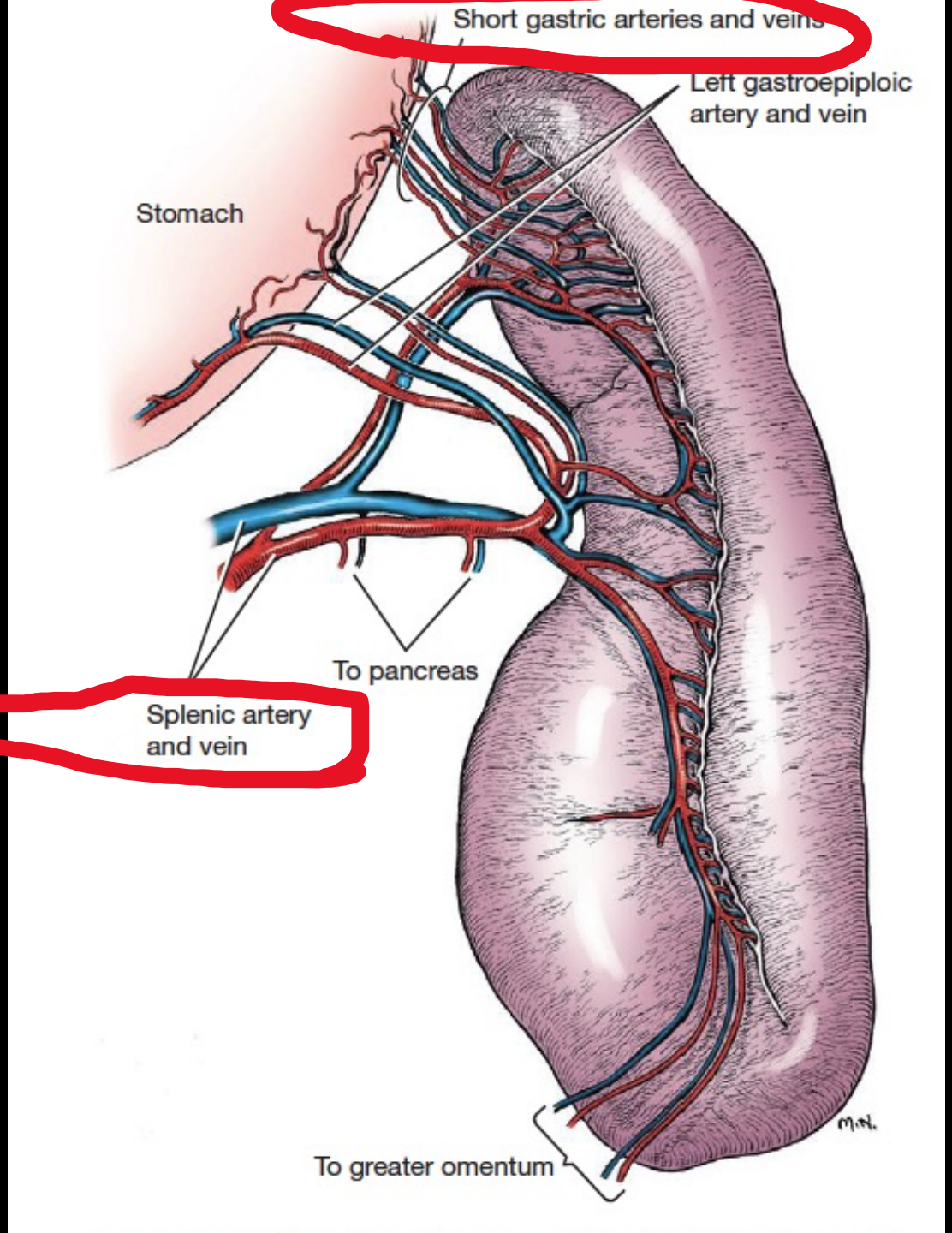
Other splenic malignancies

- Round cell infiltration
  - Mast cell tumor
    - Low sensitivity for detection (43%)

Surgery

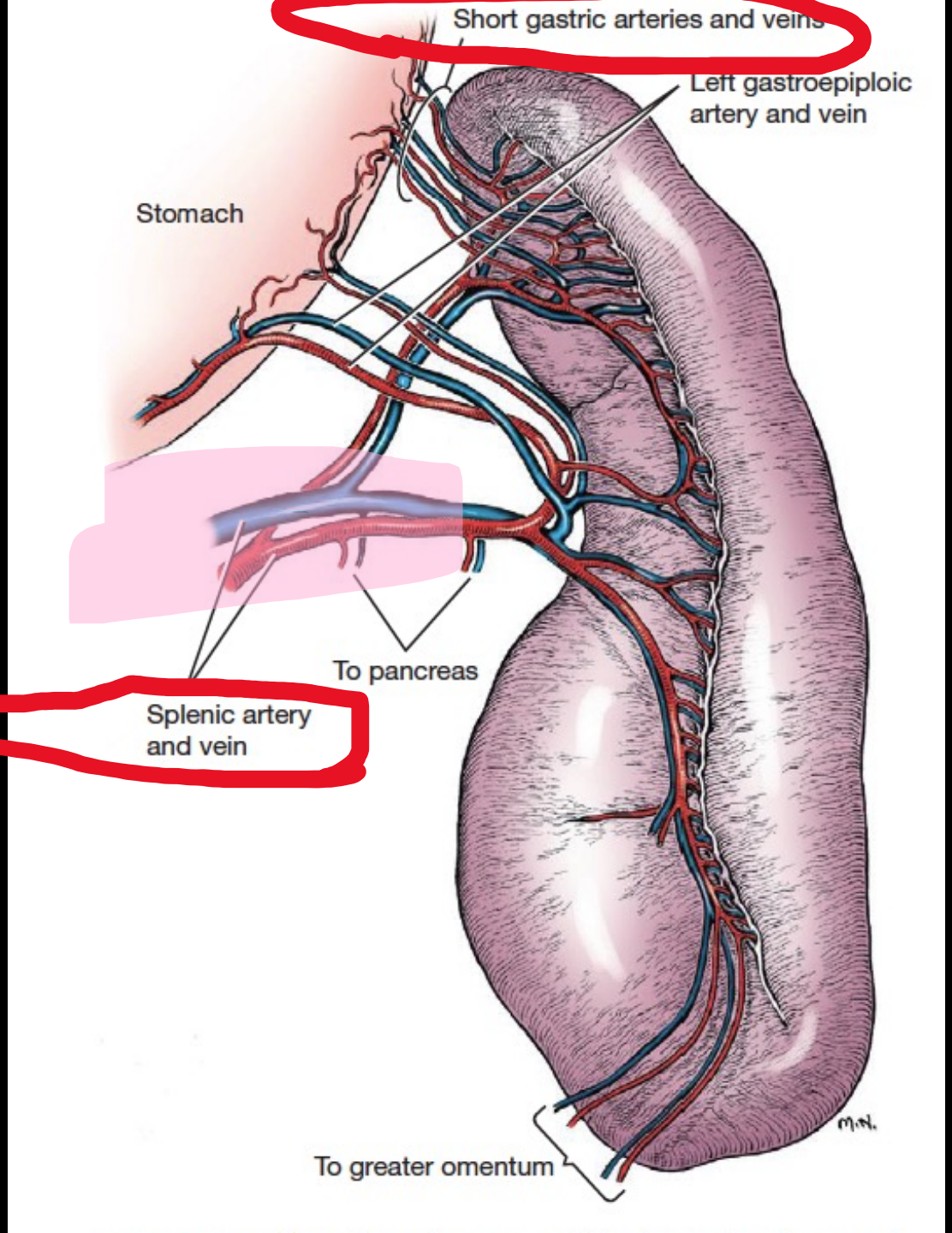
Splenectomy

- Anatomy
  - Two major vessels
    - Splenic
    - Short gastric



Splenectomy

- Anatomy
  - Two major vessels
    - Splenic
    - Short gastric
  - L limb of pancreas
    - Neighbor next door
      - Splenic vessels
  - How to find them?
    - Hiding in omental bursa
      - = Go into the bursa



Splenectomy

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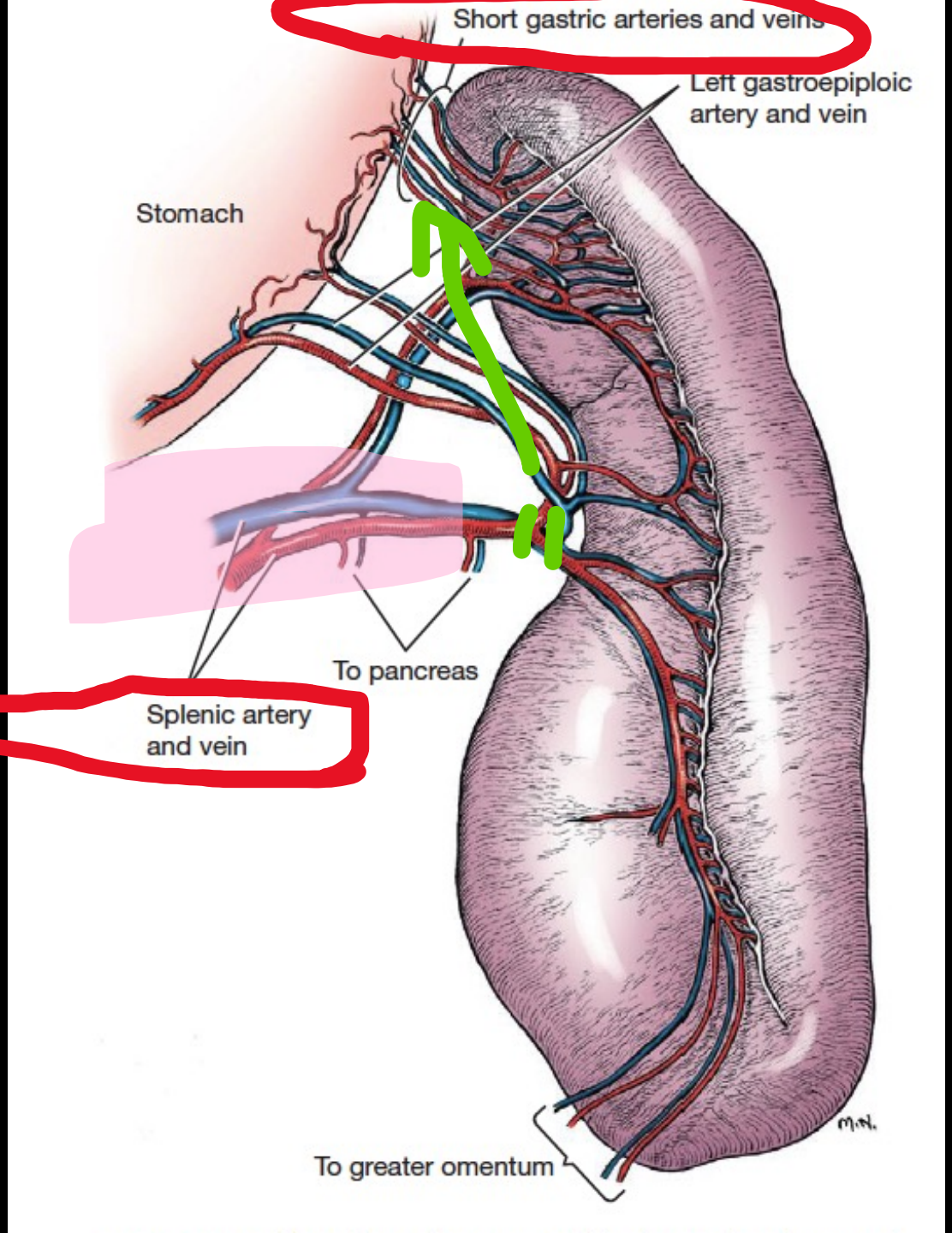
    - Short gastric
  - L limb of pancreas
    - Neighbor next door
      - Splenic vessels
  - How to find them?
    - Hiding in omental bursa
      - = Go into the bursa

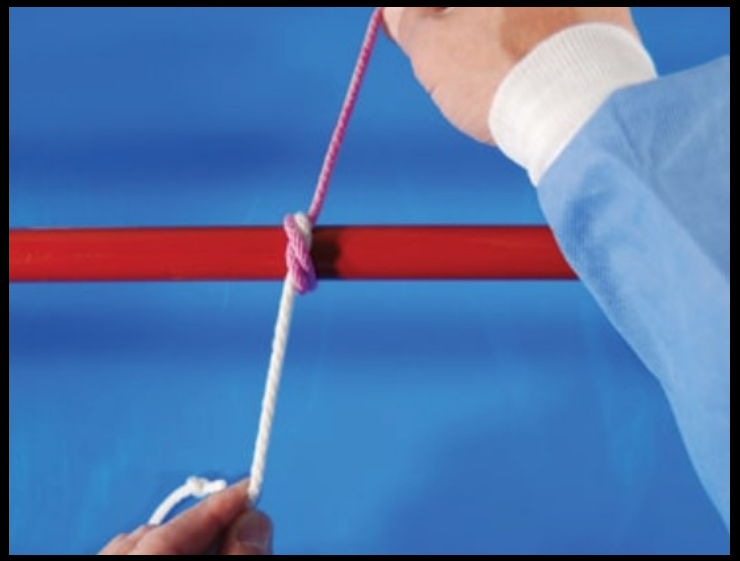
Splenectomy

- Procedure
  - Splenic vessels ligation
    - Stay away from L limb of pancreas
  - Then go cranial



Splenectomy

- Worried about bleeding?
  - Splenic vessels ligation
    - Strangle knot
      - ≒ Modified Miller's knot
      - = Essential for large vessel ligation



Reference: https://todaysveterinarypractice.com/soft-tissue-surgery/surgical-skills-creating-a-leak-proof-ligature-with-confidence-part-2-step-by-step-approach-to-surgical-binding-knots/

Splenectomy

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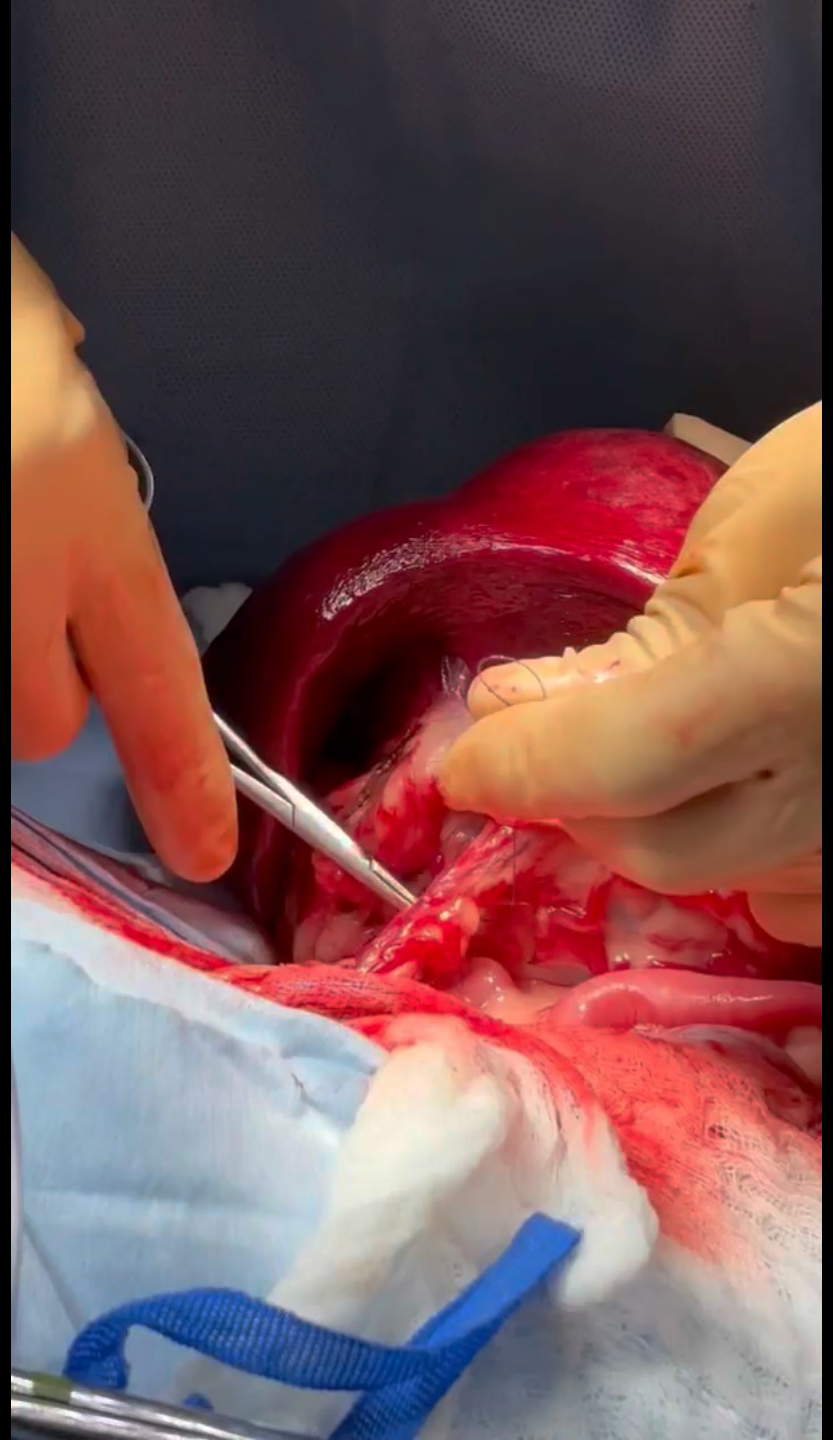
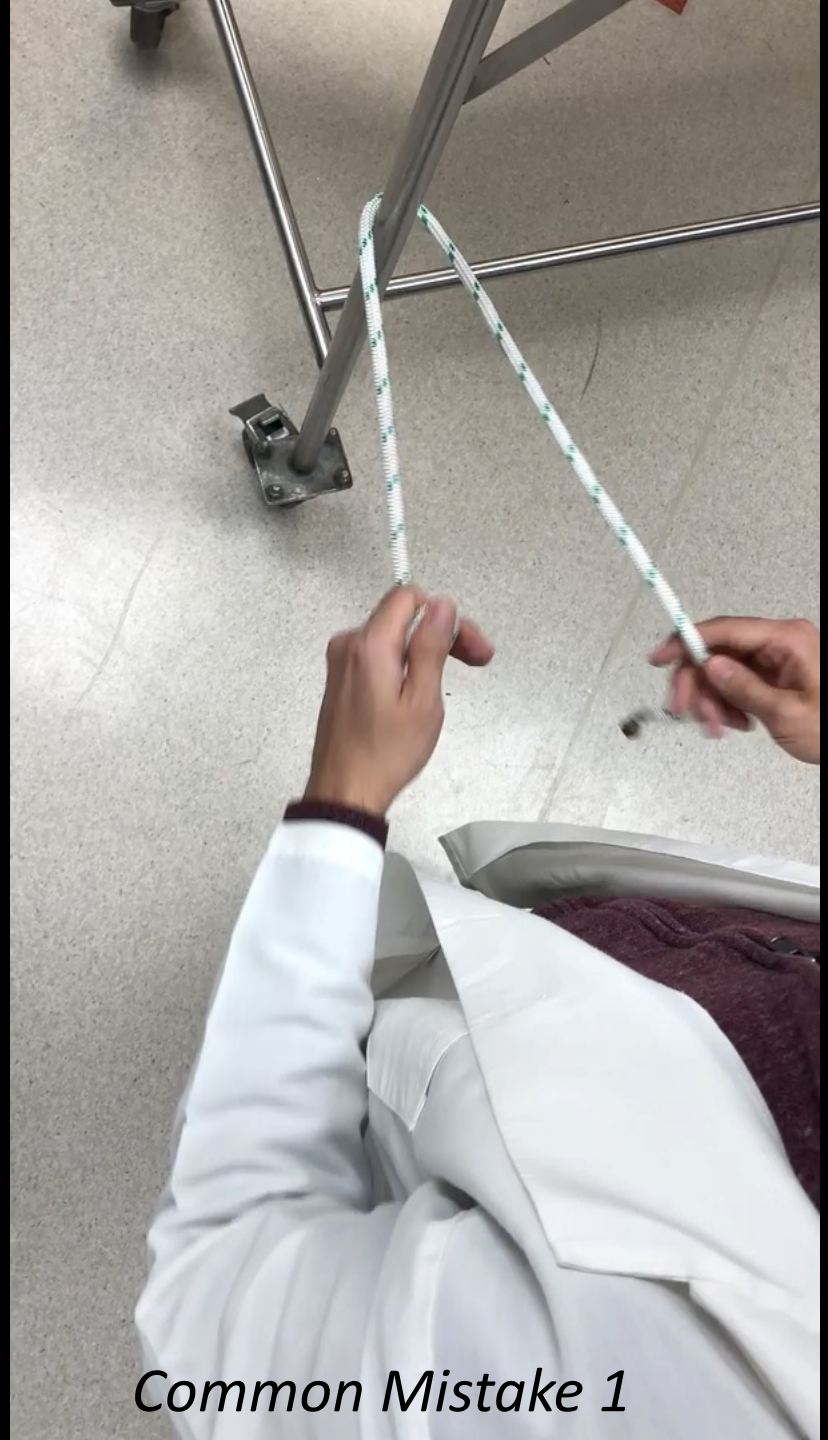


Splenectomy

- Worried about bleeding?
  - Common mistakes
    - Loosing tightness
      - By “pull” after the first knot
      - Tissue too thick



Common Mistake 1

Common Mistake 2

Bleeding? No worries

https://www.cmrelectrical.com/water-leak-prevention/

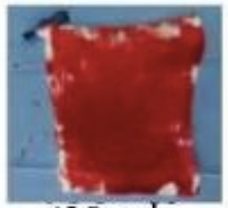
Hemostasis

- Acceptable blood loss
  - = amount without significant CV change
  - < 10% generally ok
  - >15-20% likely need help (transfusion/support)

What is his 10% of blood volume?

- Sam
  - 8 year old, MC, Pitbull
  - 30kg
- Circulating blood volume
  - =90ml/kg
  - 90*30 = 2700ml
  - 0.1*2700 = 270ml

How to estimate blood loss in surgery

	Percentage of Saturation			
	25%	50%	50%	100%
10×10 cm	 3 mL	 6 mL	 6 mL	 12 mL
30×30 cm	 25 mL	 50 mL	 75 mL	 100 mL
45×45 cm	 40 mL	 80 mL	 120 mL	 160 mL

Algadiem et al, 2016 ,Trauma Mo

Hemostasis Principles

- No panic
  - Enough time to manage
    - 20-30 minutes till critical/death
- Start from pressure with sponge
    - Deep breath
    - Most bleeding slow down
      - In several minutes
      - Vasoconstriction
    - Get things you need meantime
      - Ask assistant to scrub in
      - Instruments
        - Suction, gauzes, clamps

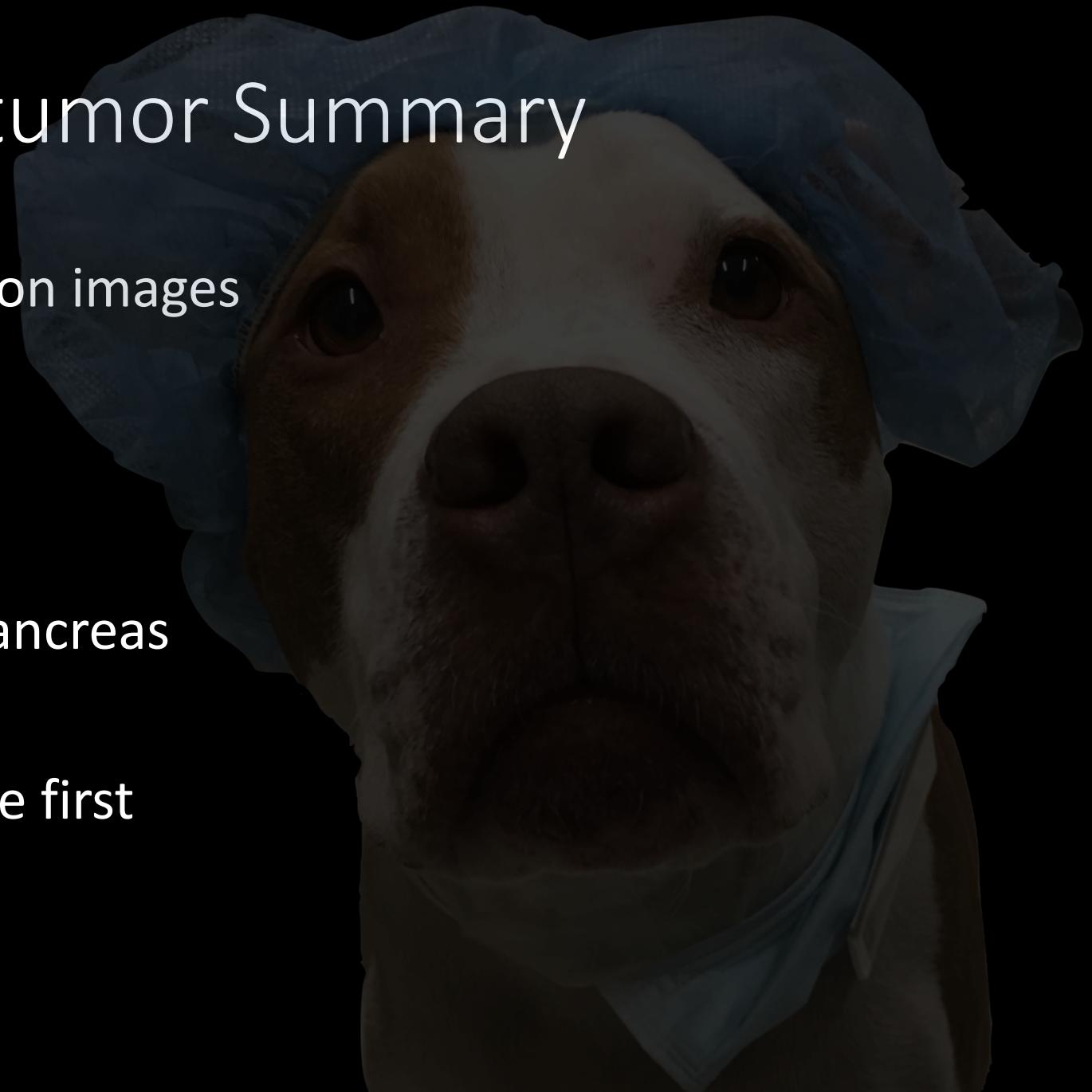
The Shining 1980

Hemostasis Principles

- Good exposure = good hemostasis
  - Extend incision till you see well
  - Importance of prep
    - Clip wide and drape wide

Splenic tumor Summary

- Know criteria of malignancy on images
- FNA is required for diagnosis
- Identify Splenic vein and L pancreas
- Bleeding – No panic, pressure first



Thank you!

OVET STRATEGY