Lights, Camera, Abdomen!

Getting the most out of basic GI imaging

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IDEXX Telemedicine Consultants

Financial Disclosure

I have a commercial relationship with IDEXX, but do not believe that it will influence my presentation.

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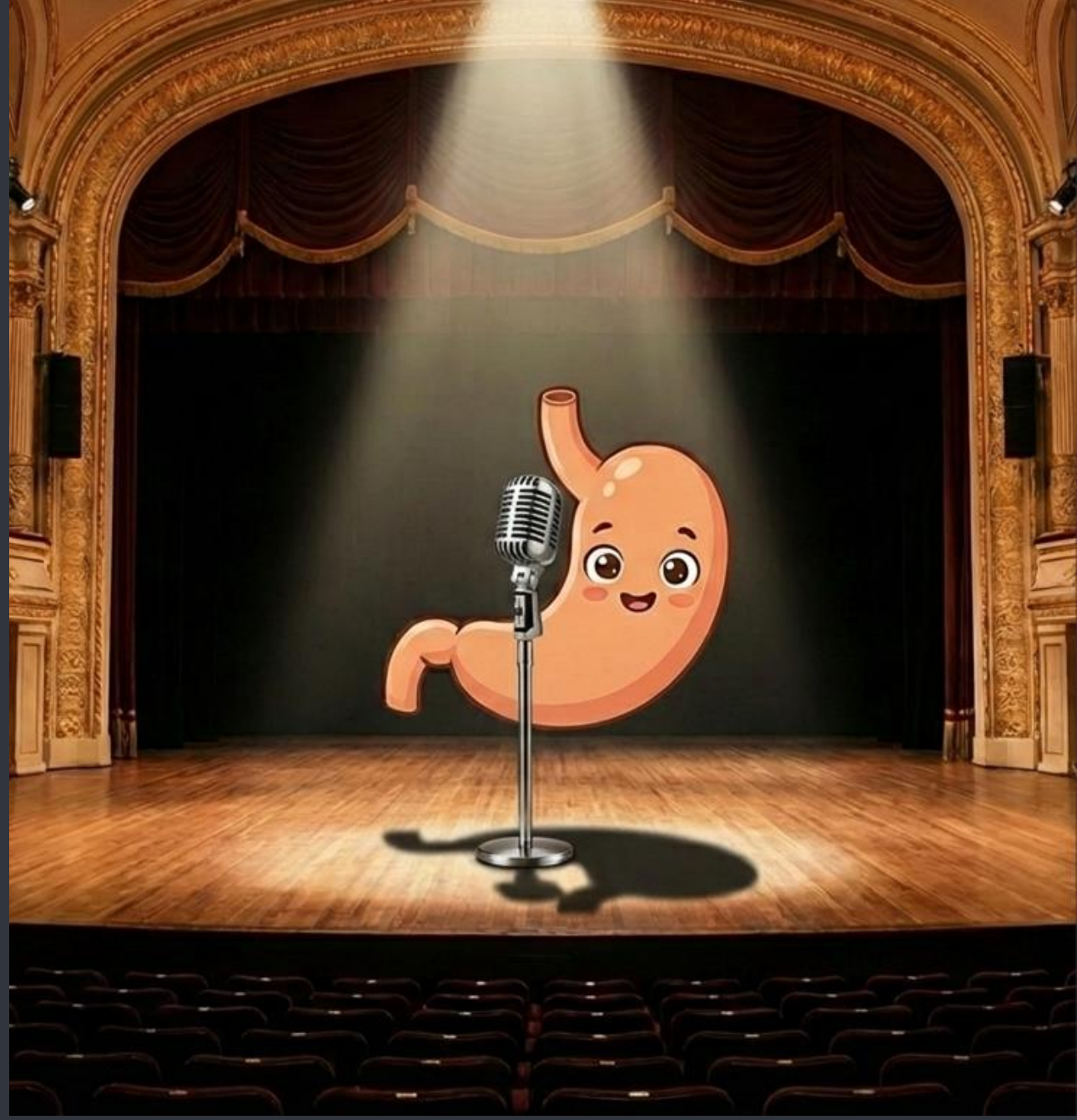
Outline

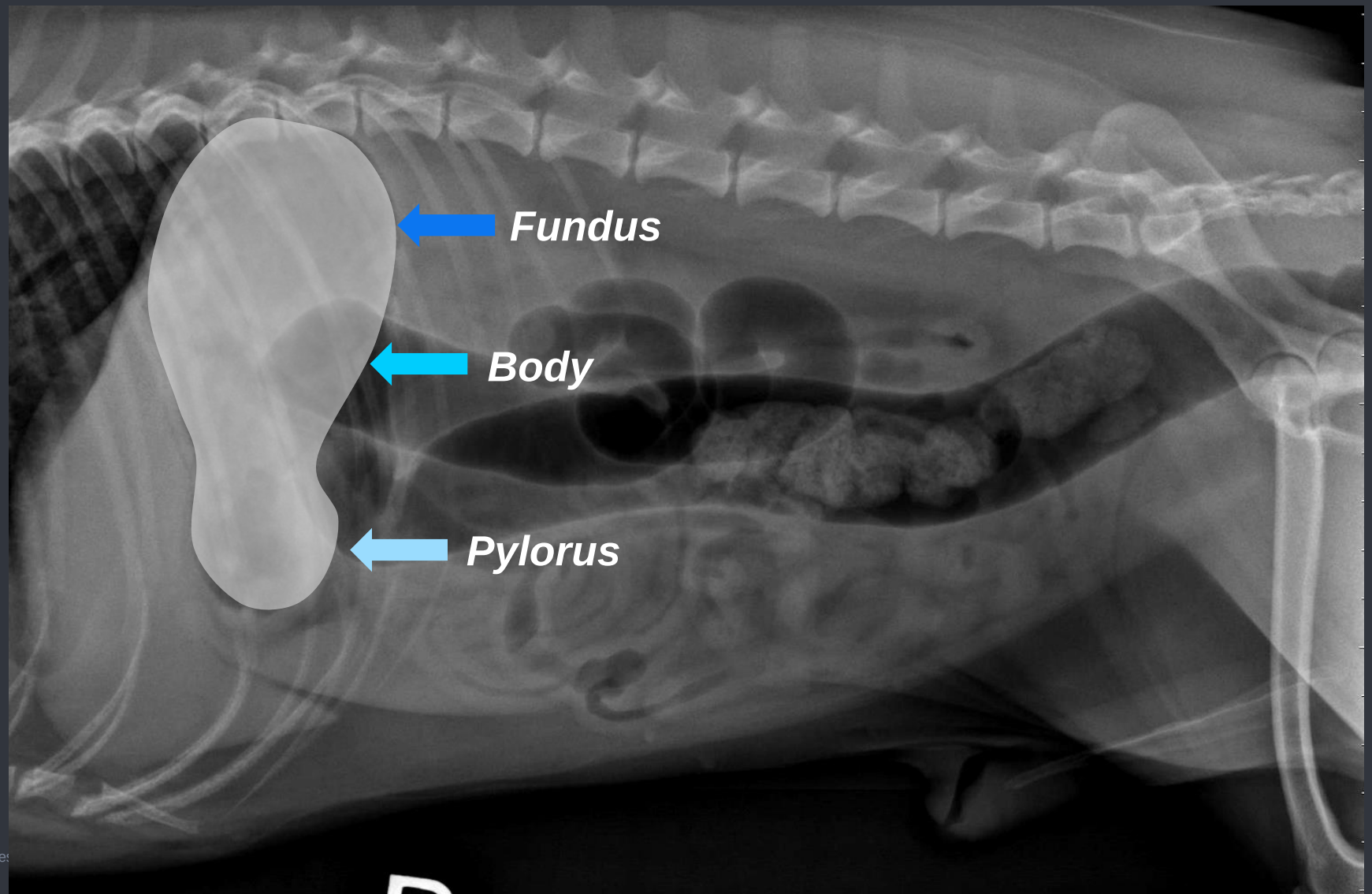
1. Normal anatomy of the GI tract and Pancreas

2. Case-based discussions

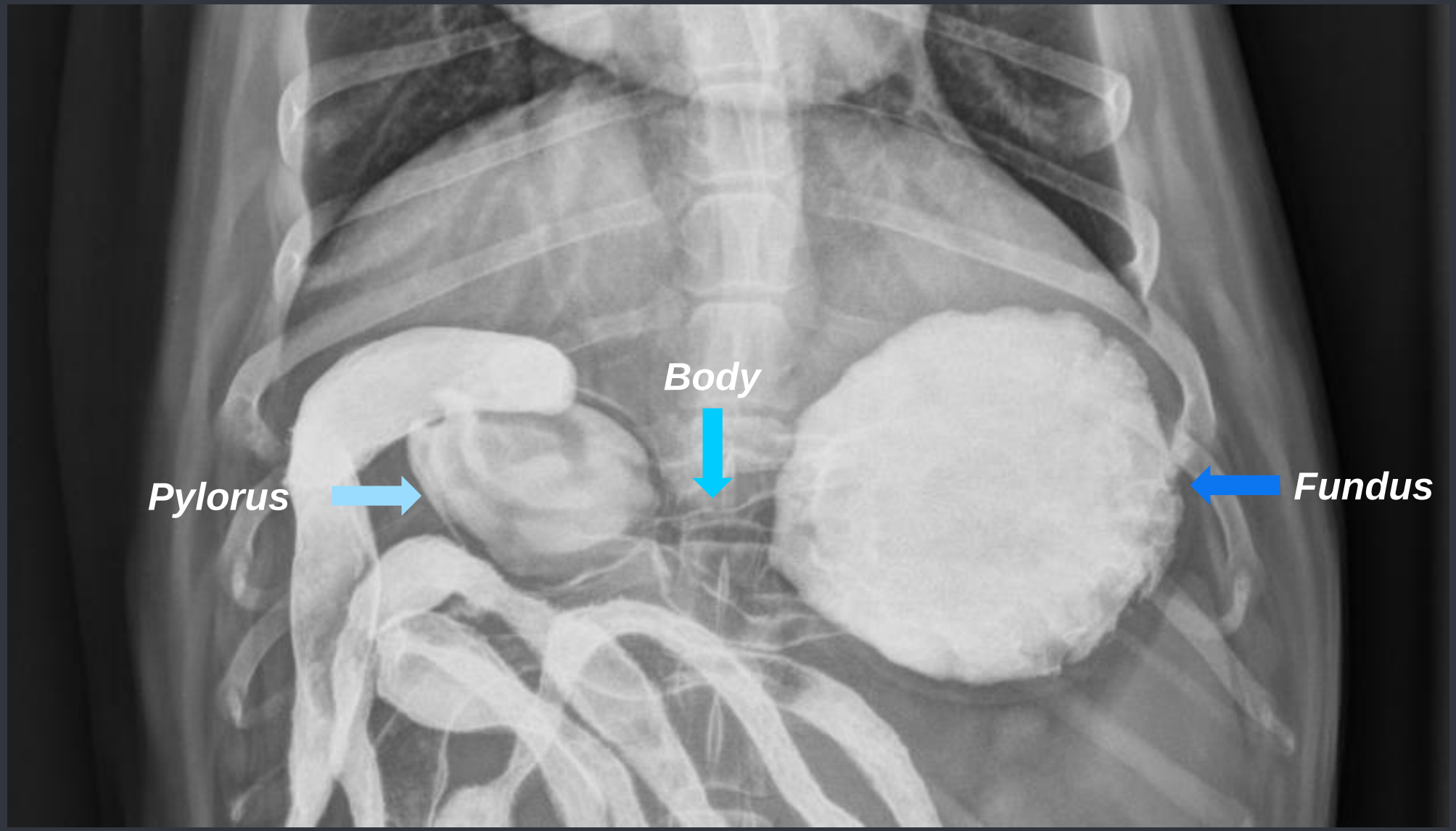


Normal Anatomy

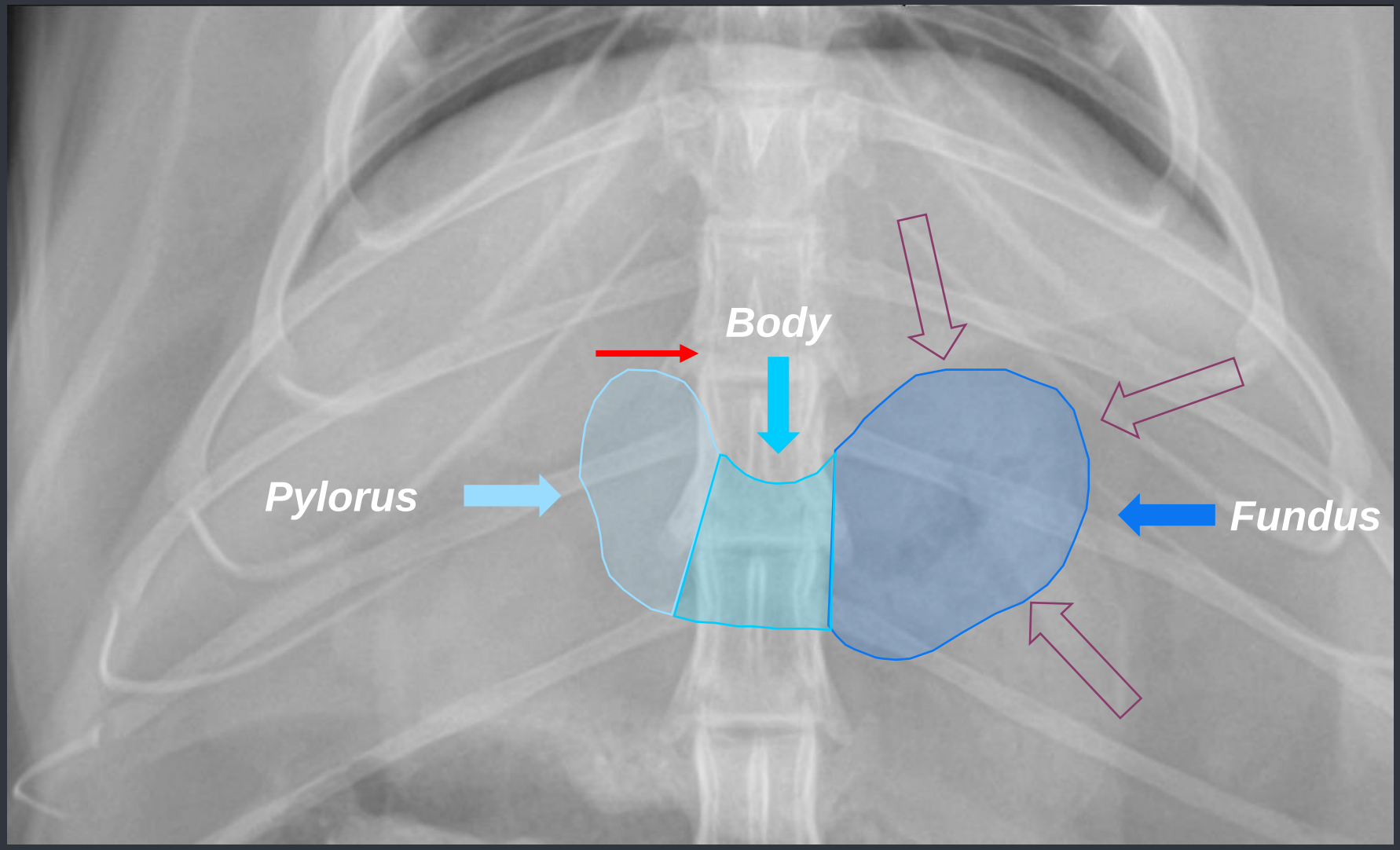
Normal Anatomy of the Canine Stomach



Normal Anatomy of the Canine Stomach



Normal Anatomy of the Feline Stomach

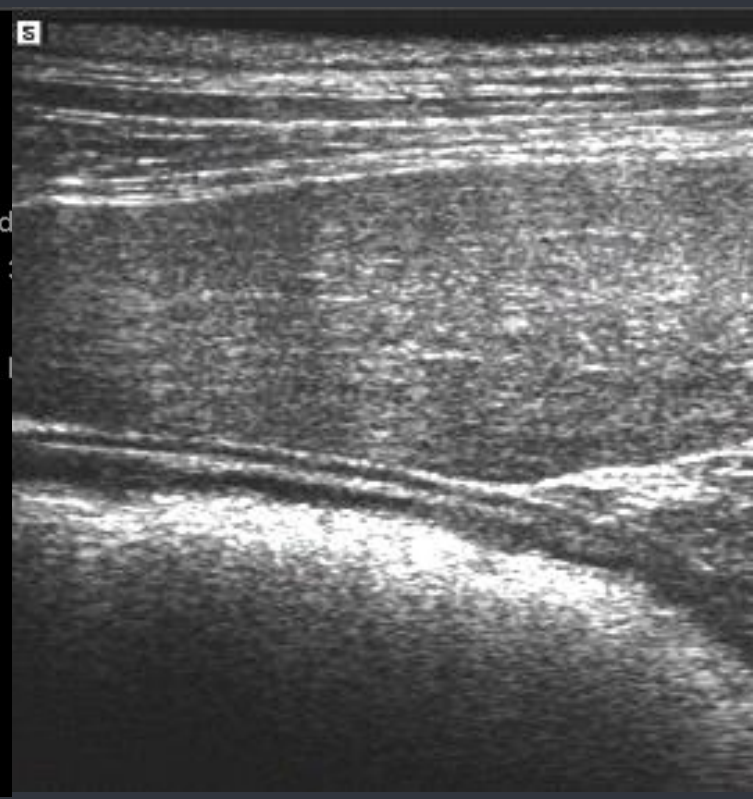


Ultrasound- Empty Stomach

Ultrasound- Stomach

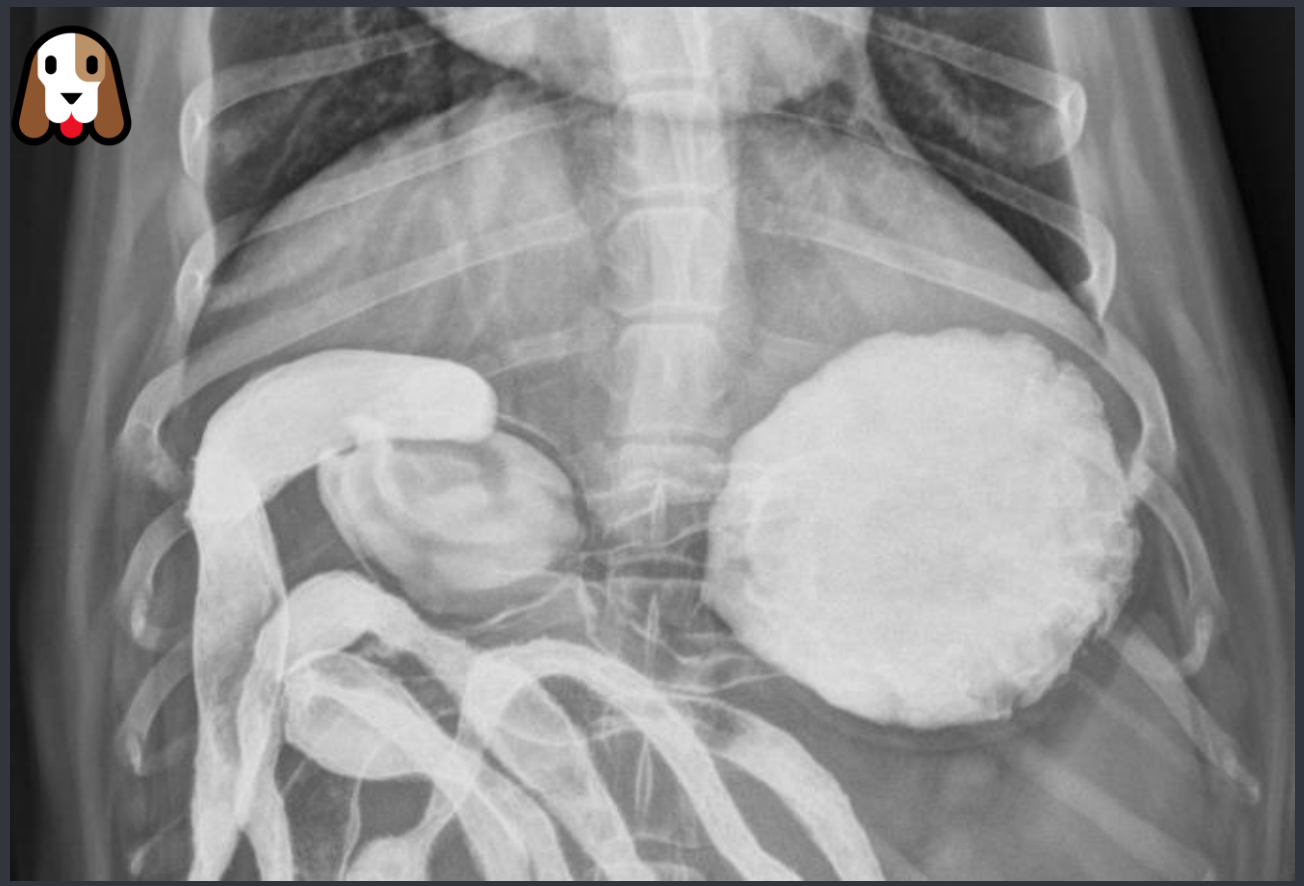
rugal folds

with ingesta



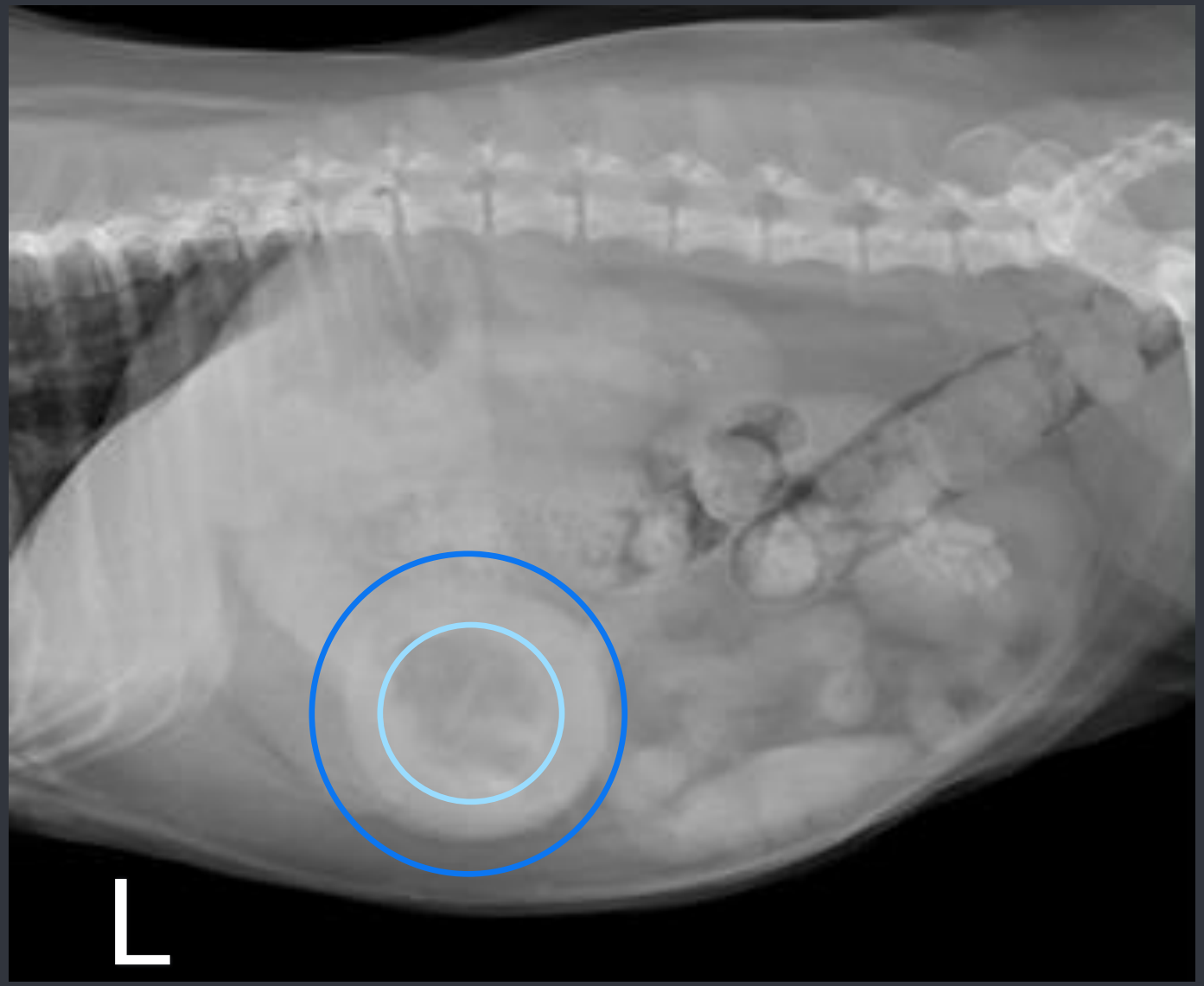
gas distended

Normal Anatomy of the Pylorus

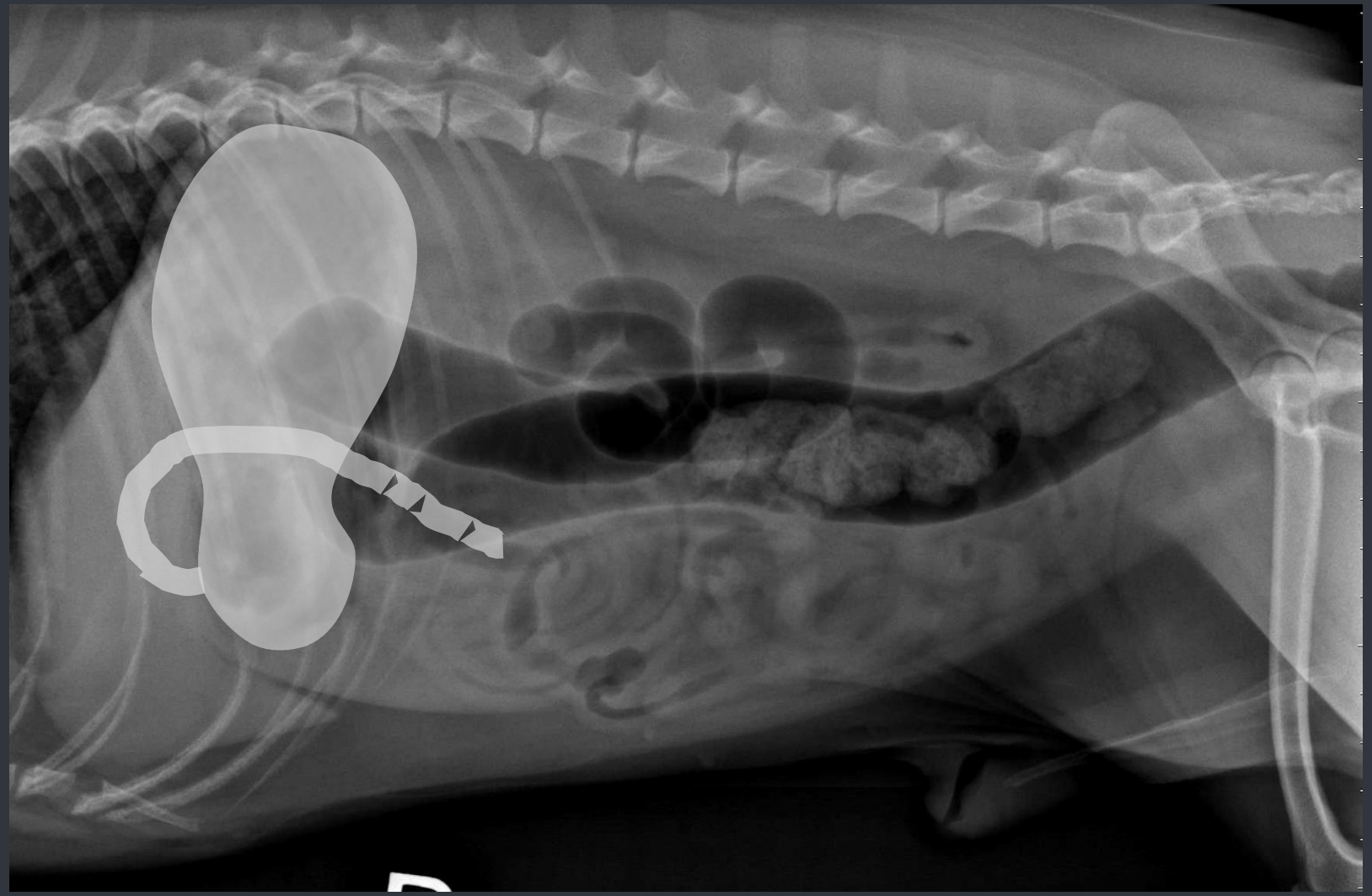


Appearance of the pylorus: Right vs. Left Lateral Views

Normal fluid filled Pylorus



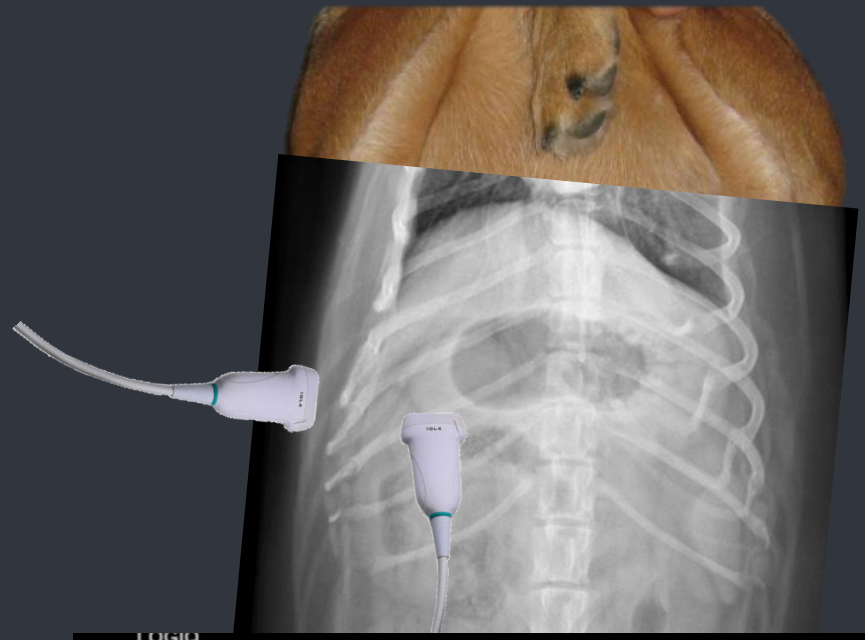
Normal Anatomy of Pyloroduodenal Junction

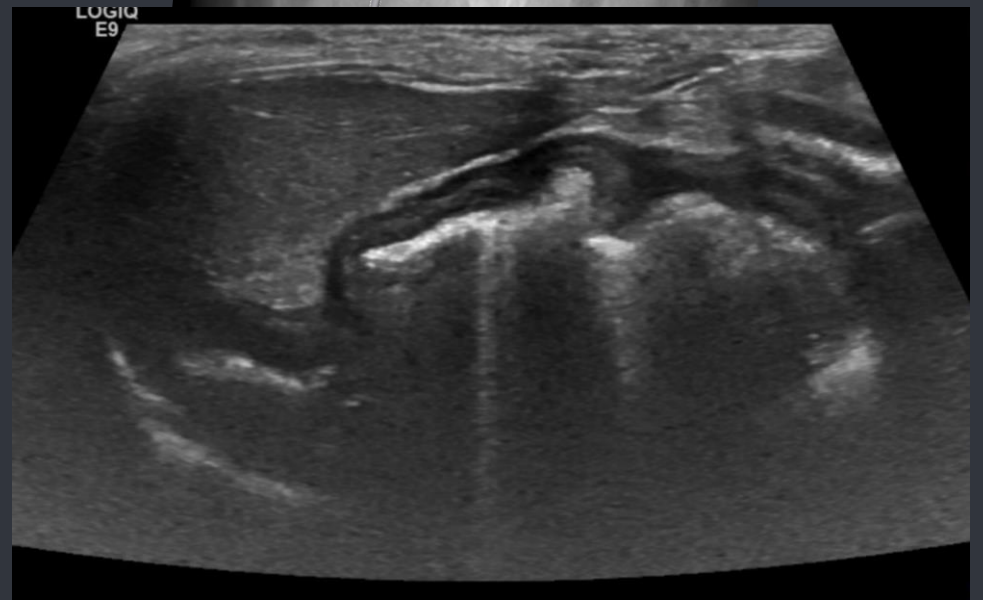


Ultrasound of Pyloroduodenal Junction

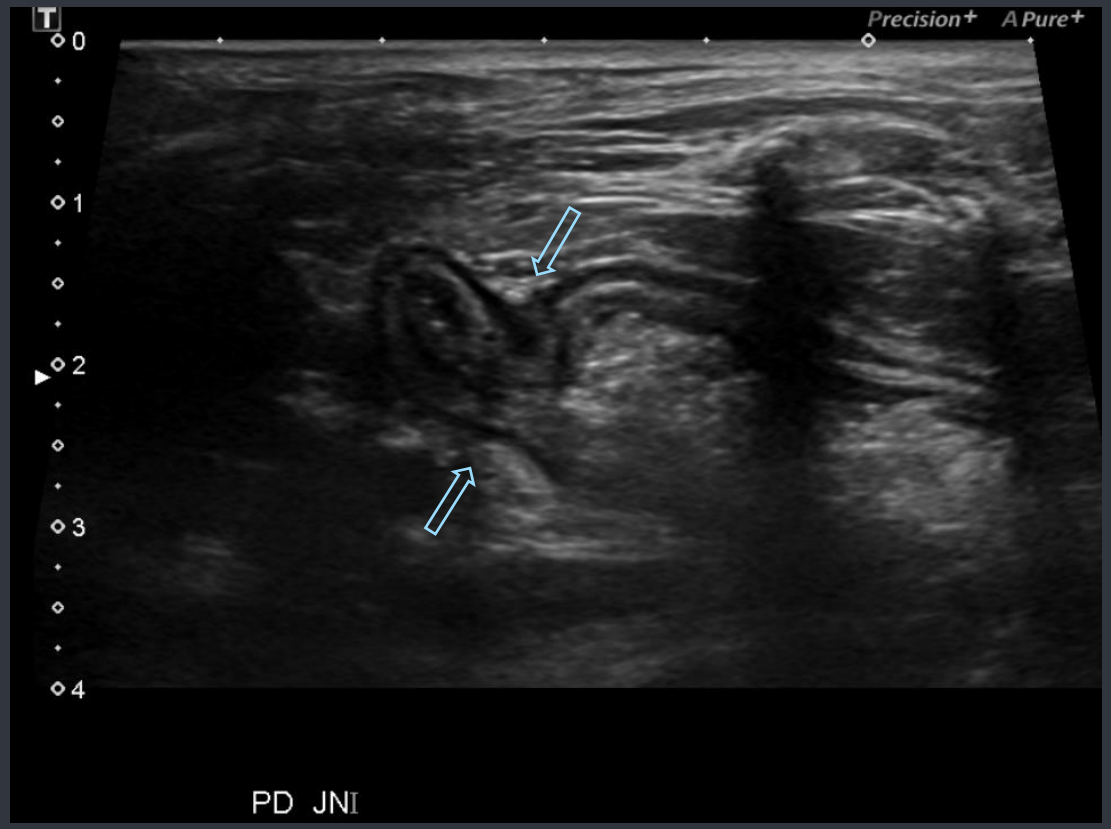
- Pylorus
  - Cranial location- under the ribs
  - Especially in deep chested and larger dogs!

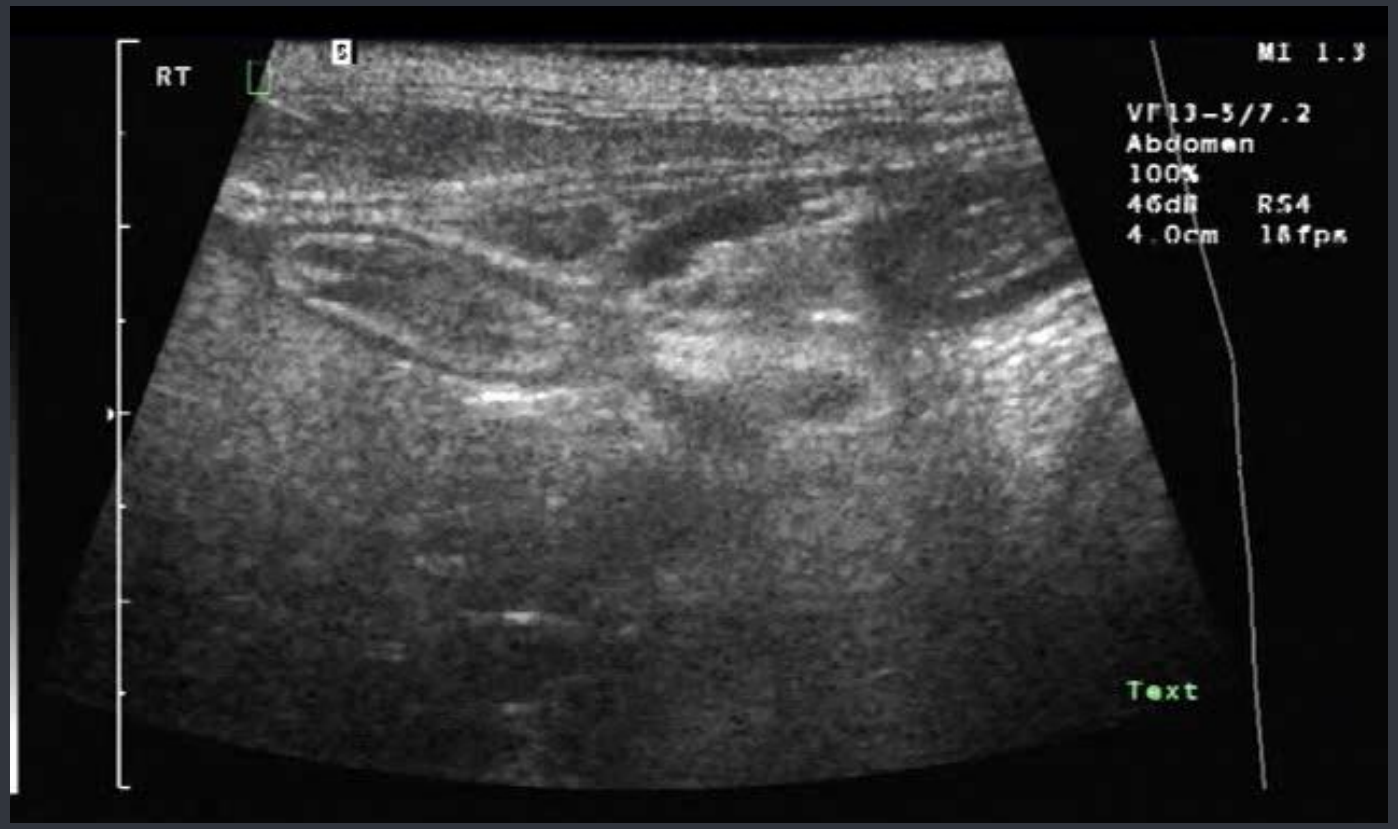
- Descending duodenum
  - Along the right lateral body wall in the dog





Ultrasound- Pyloroduodenal junction



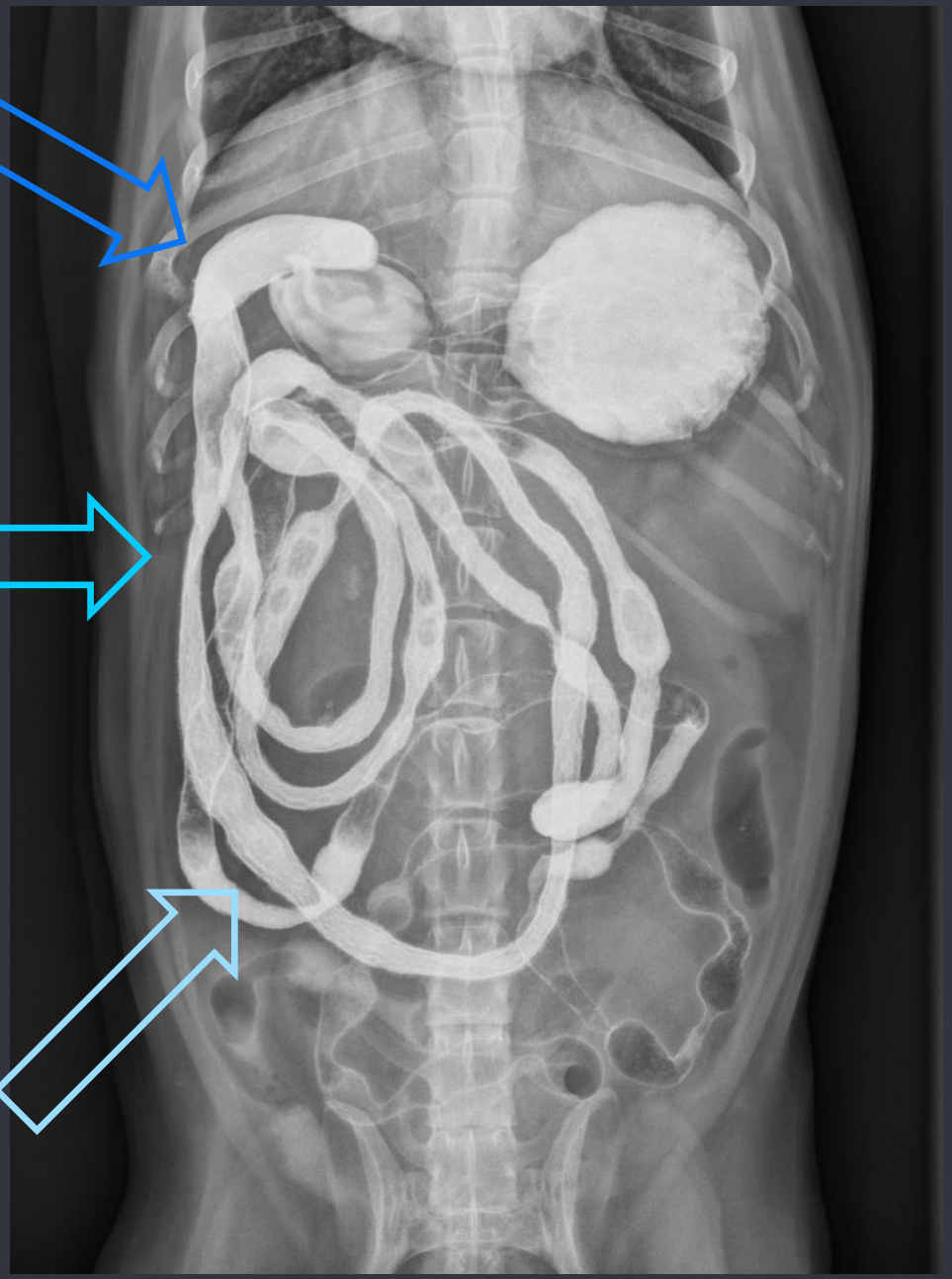


Duodenum

Proximal duodenal flexure

Descending duodenum

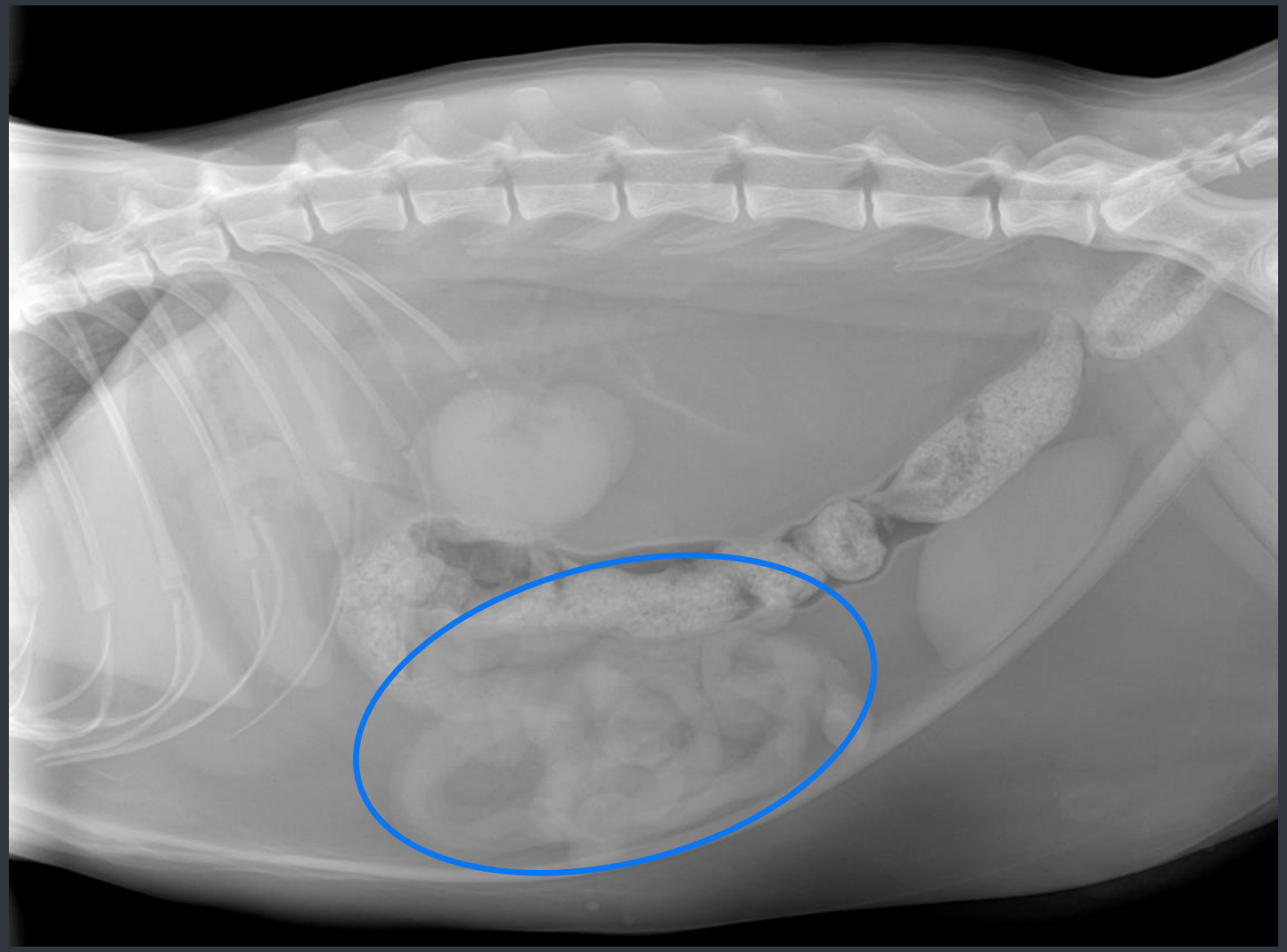
Distal duodenal flexure

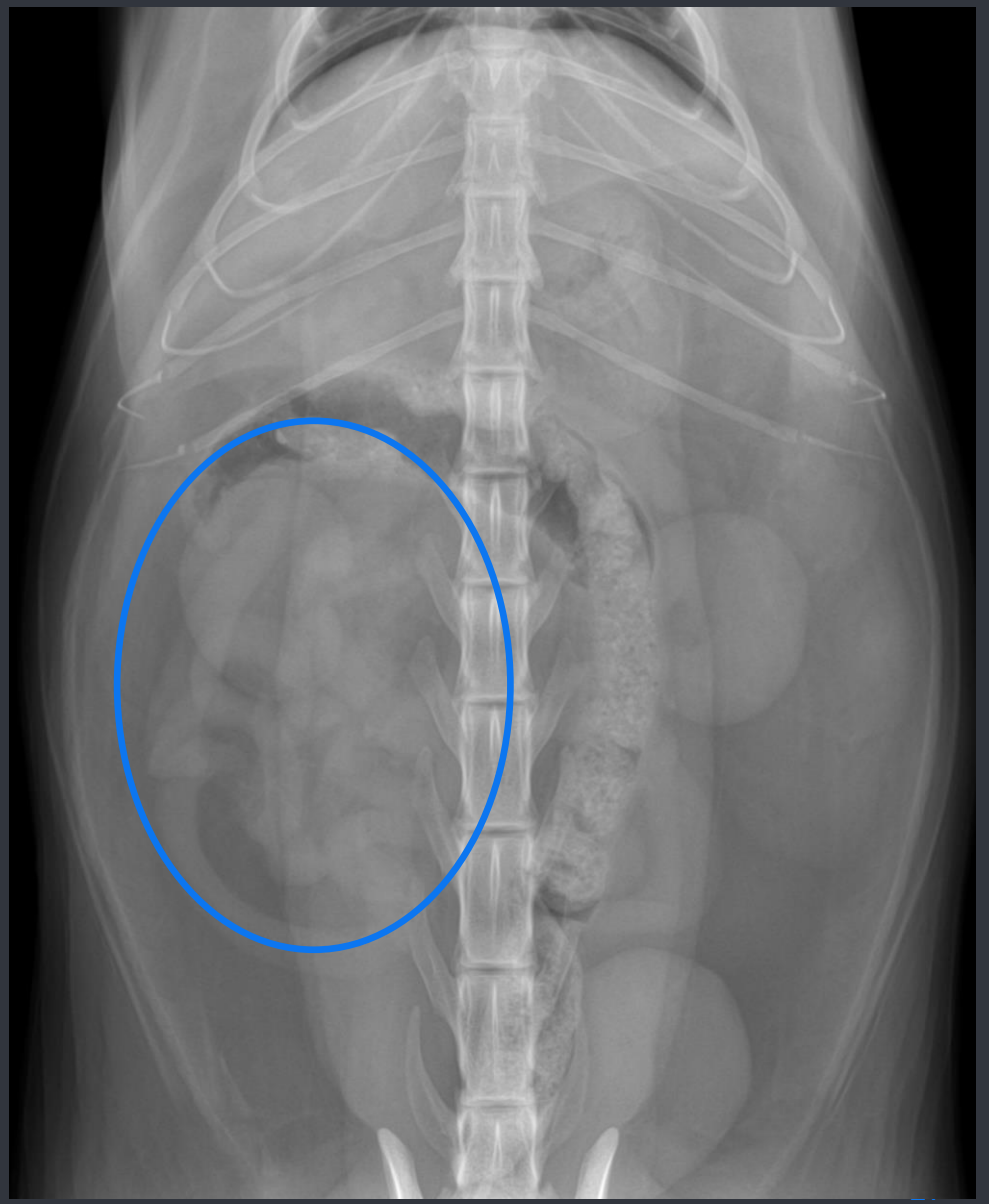


Jejunal Segments

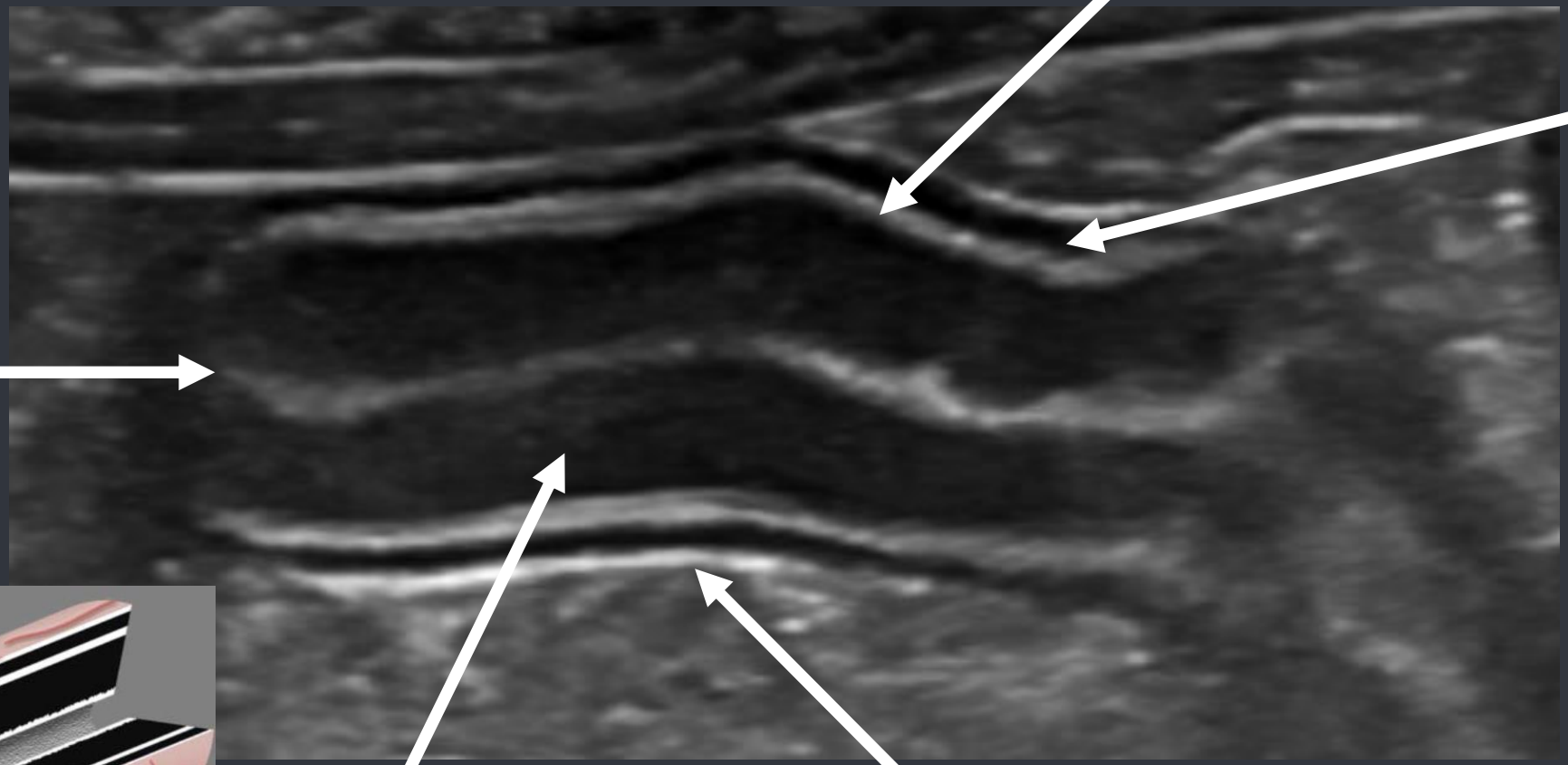
- Distributed throughout the peritoneal space- and may be quite variable in position
- Should be fairly similar in size to one another
- Serosal margins should be smooth
- May vary in contents
  - Most commonly contain a combination of gas or homogenous soft tissue/fluid opacity

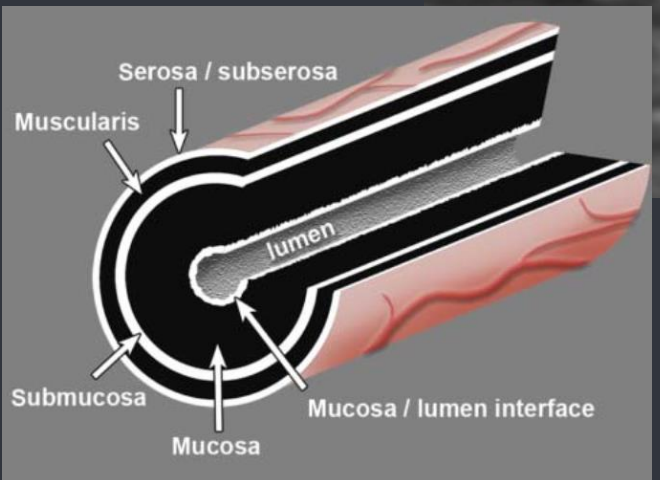
Feline Small Intestinal Segments



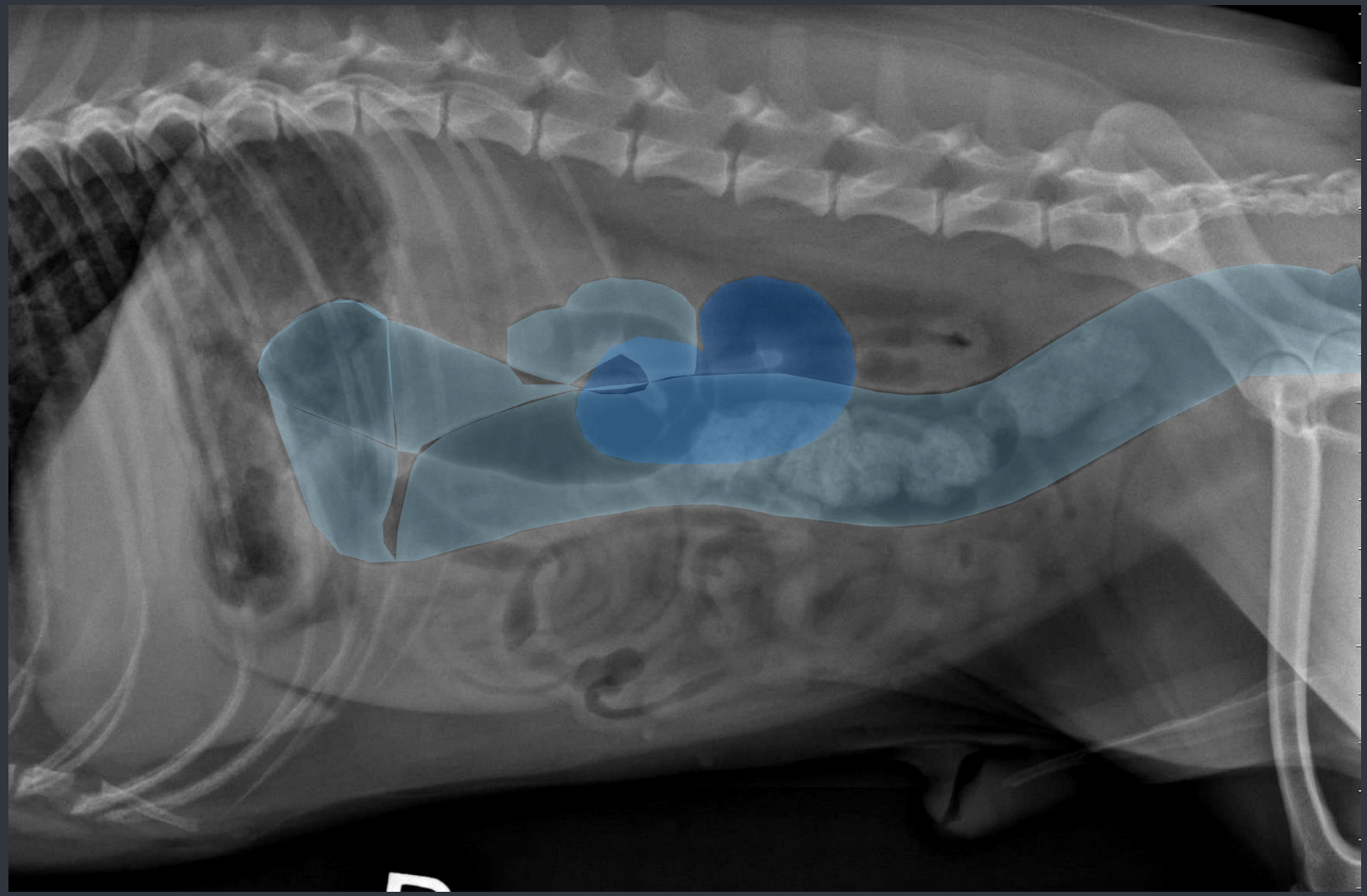


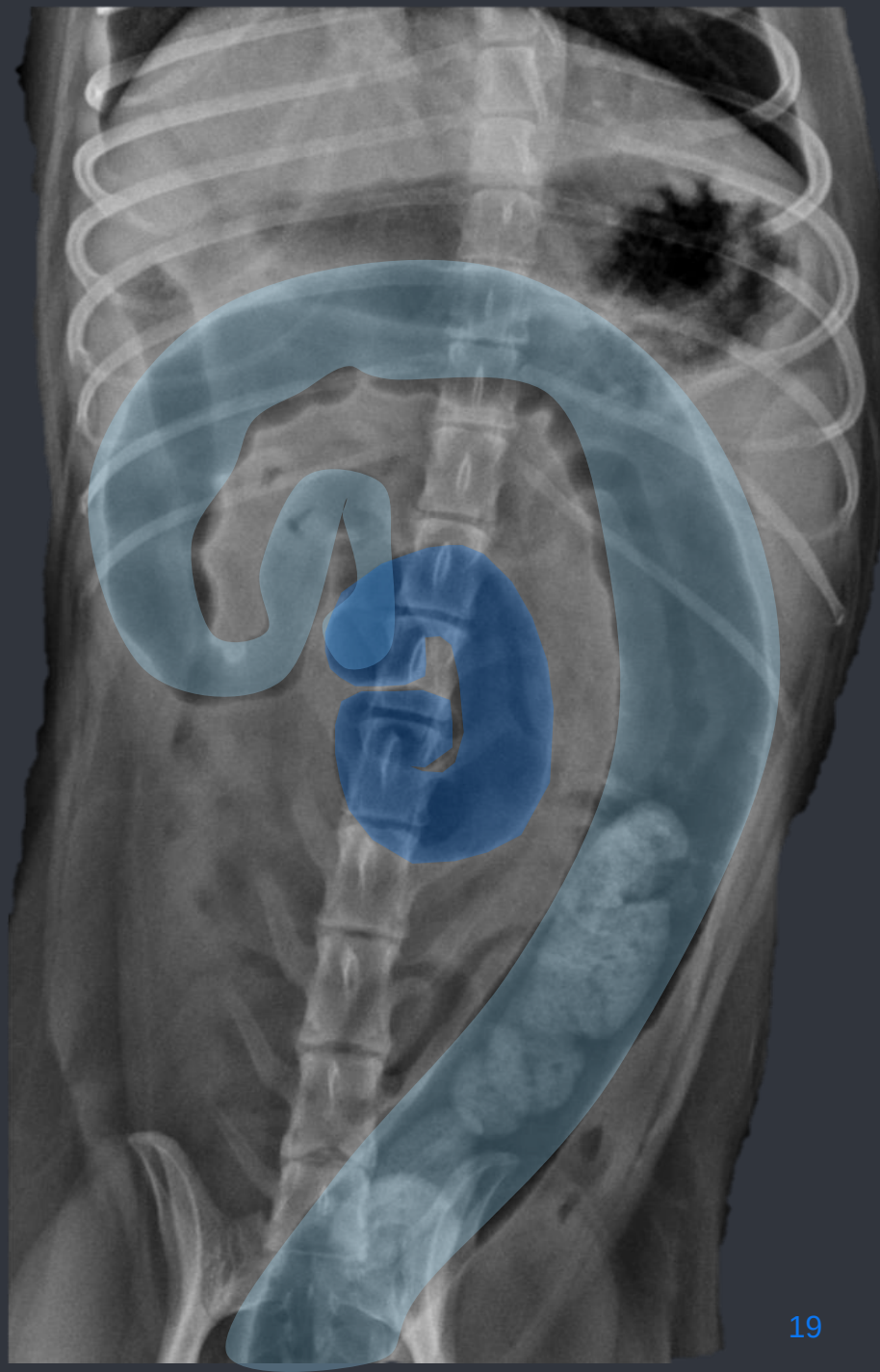
Jejunal Wall Layering



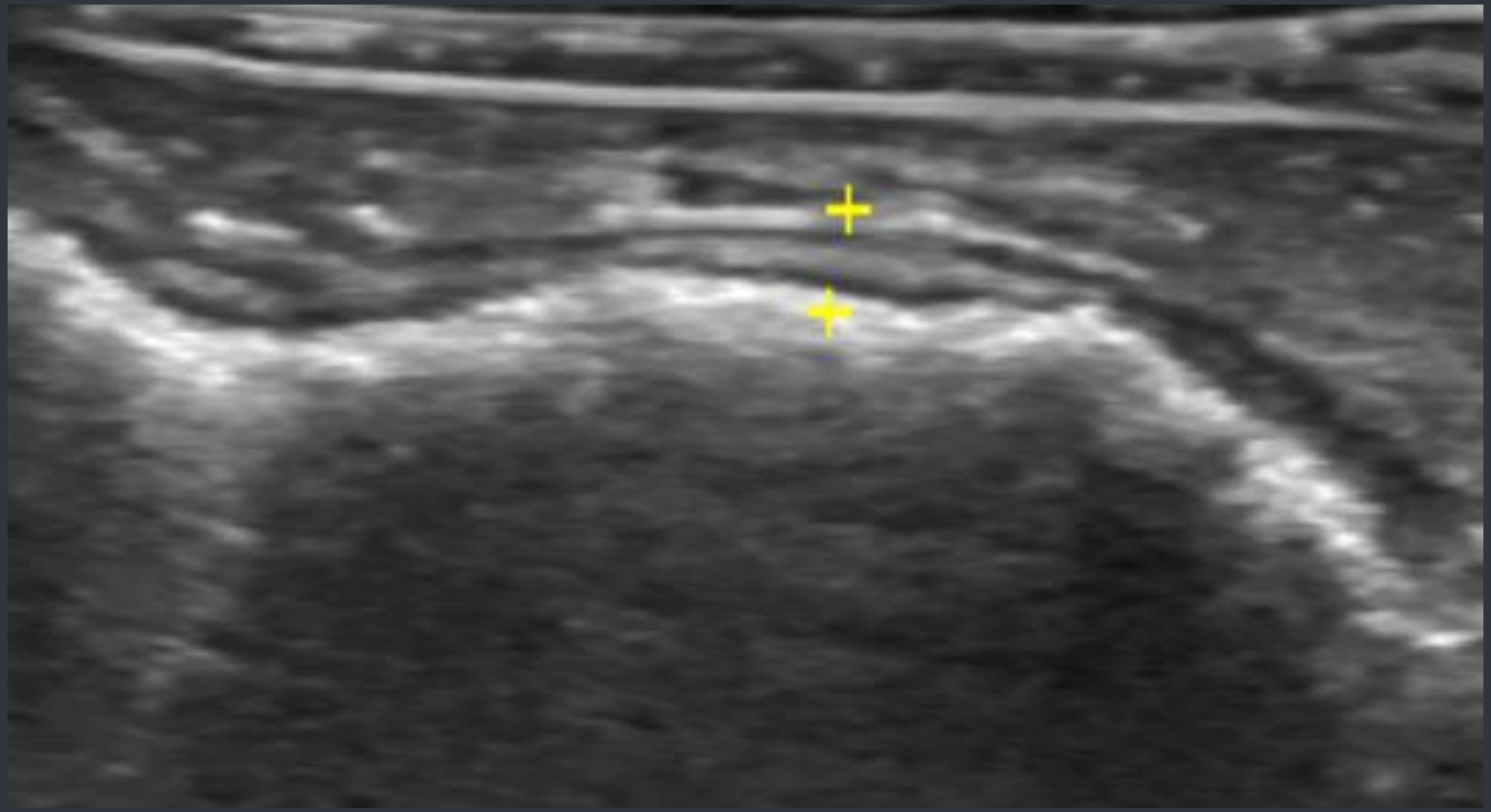


Cecum and Colon

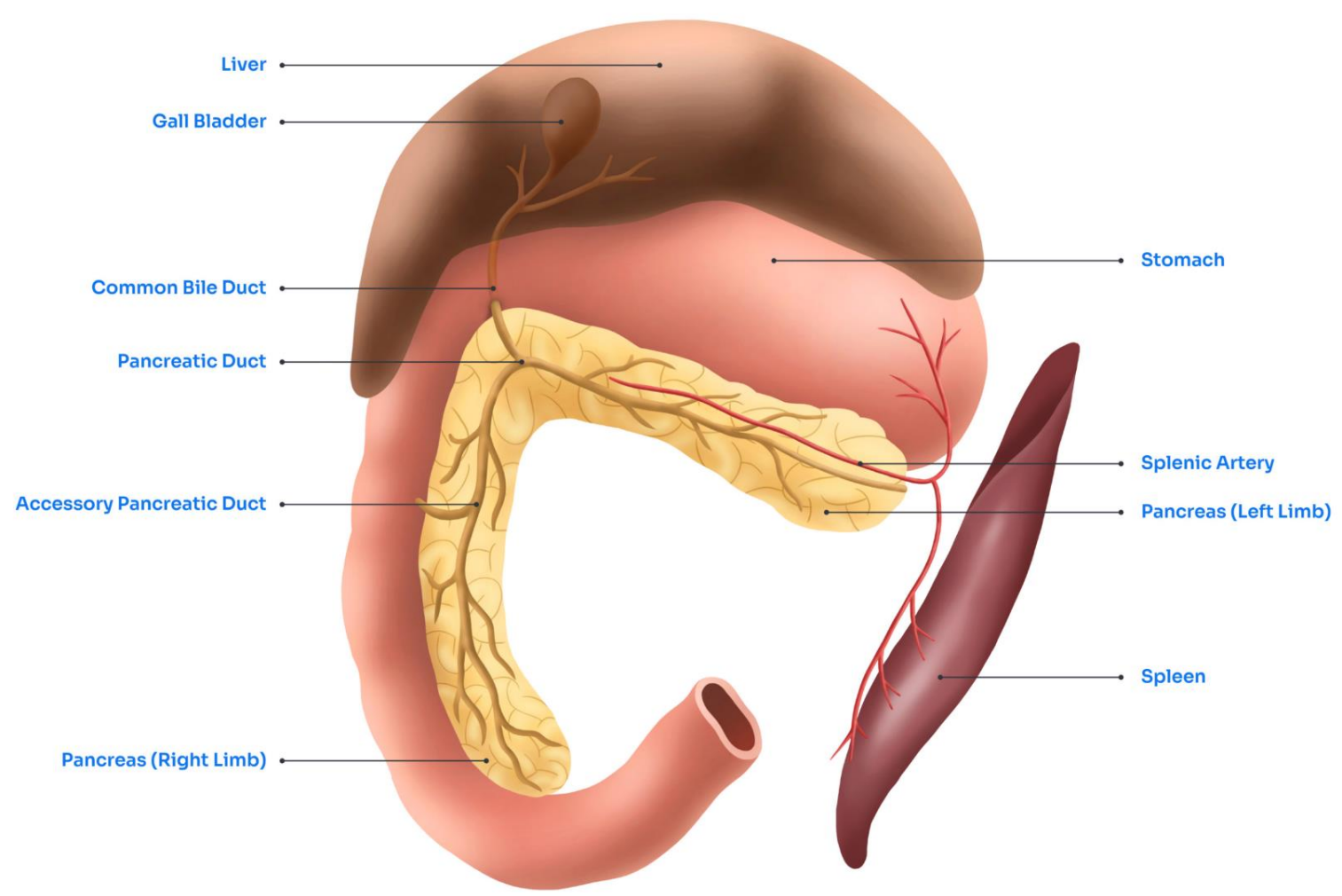


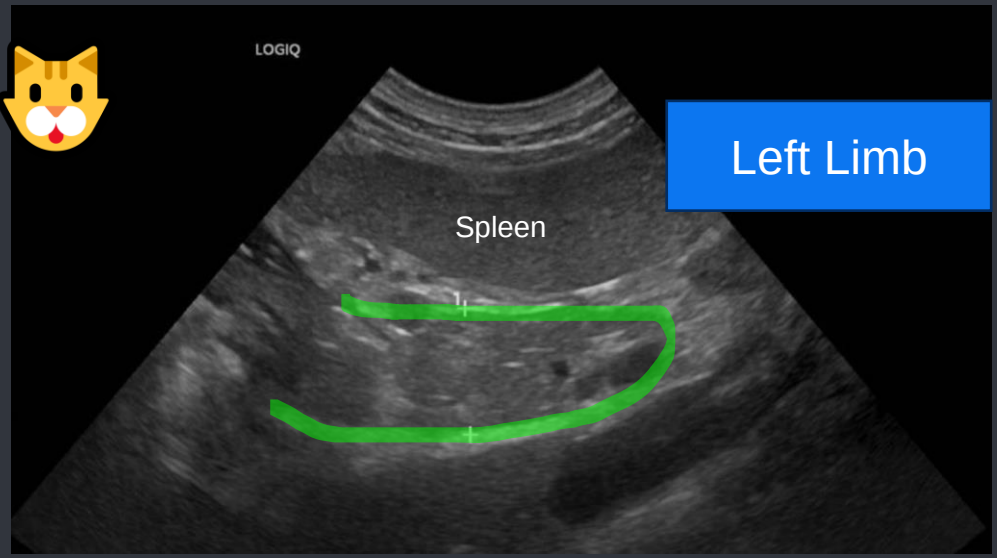


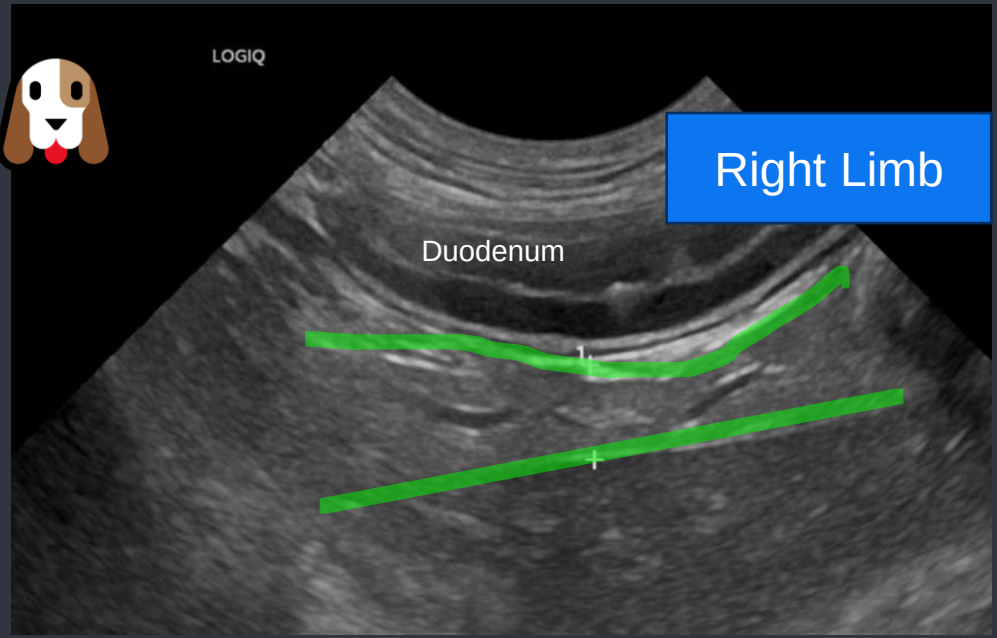
Ultrasound of the Colon



The Pancreas

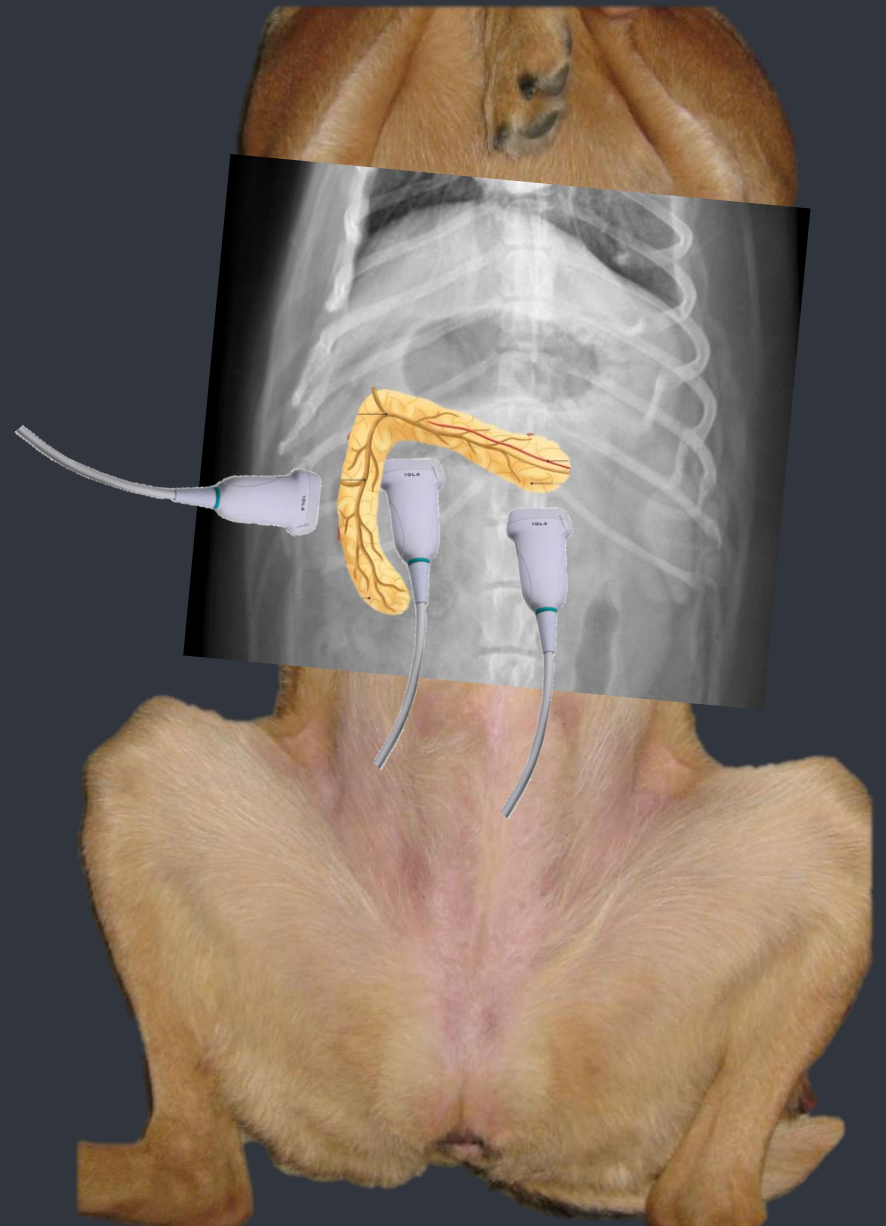






Ultrasound of Pancreas

- Body
  - Just caudal to pyloroduodenal junction
- Right limb
  - Adjacent to the descending duodenum
- Left limb
  - Caudal to gastric fundus, cranial to transverse colon
  - May be hard to see if stomach and colon are gas filled!

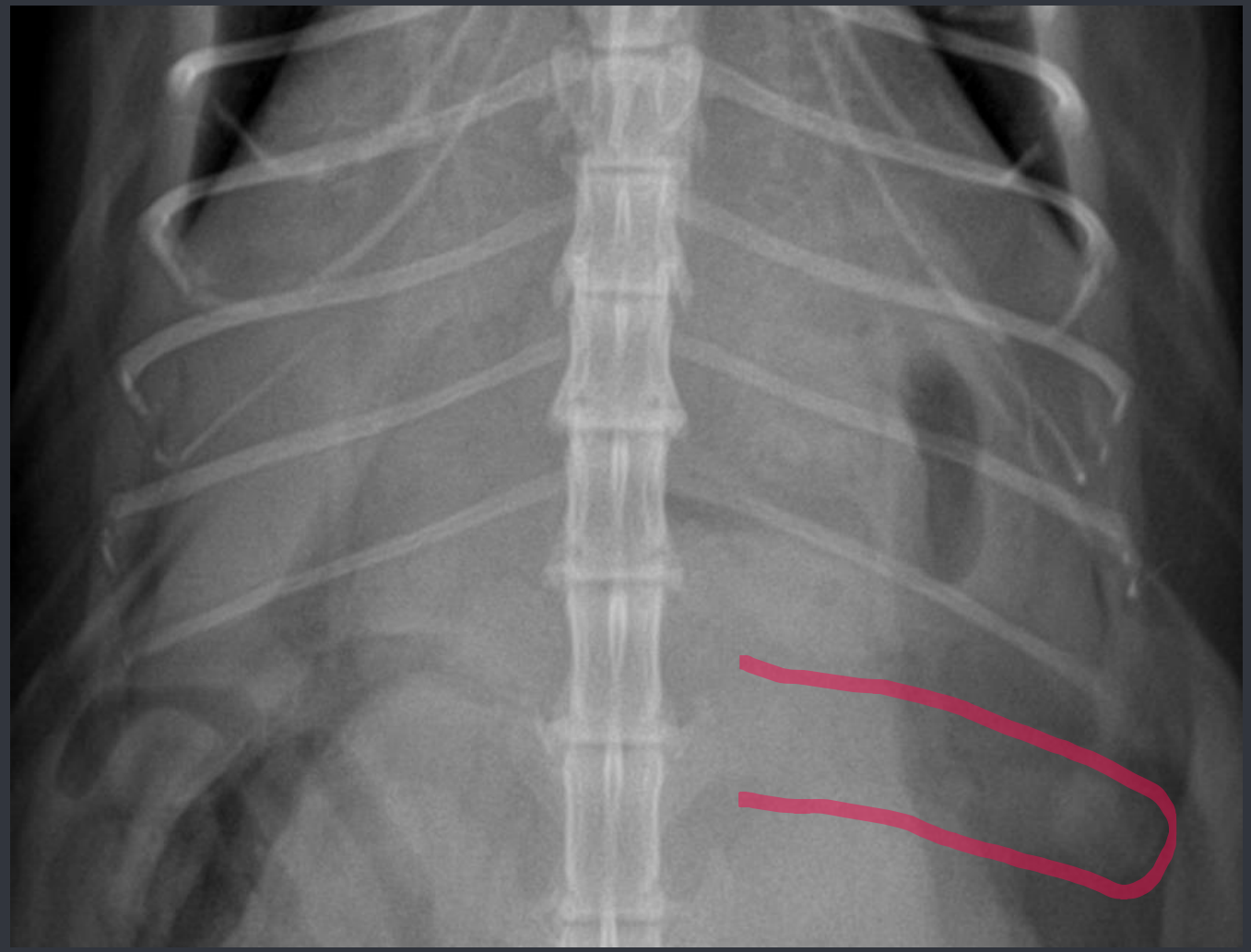


The feline pancreas may be visible on abdominal radiographs!

May be entirely normal!

- Especially in cats with generous intra-abdominal fat

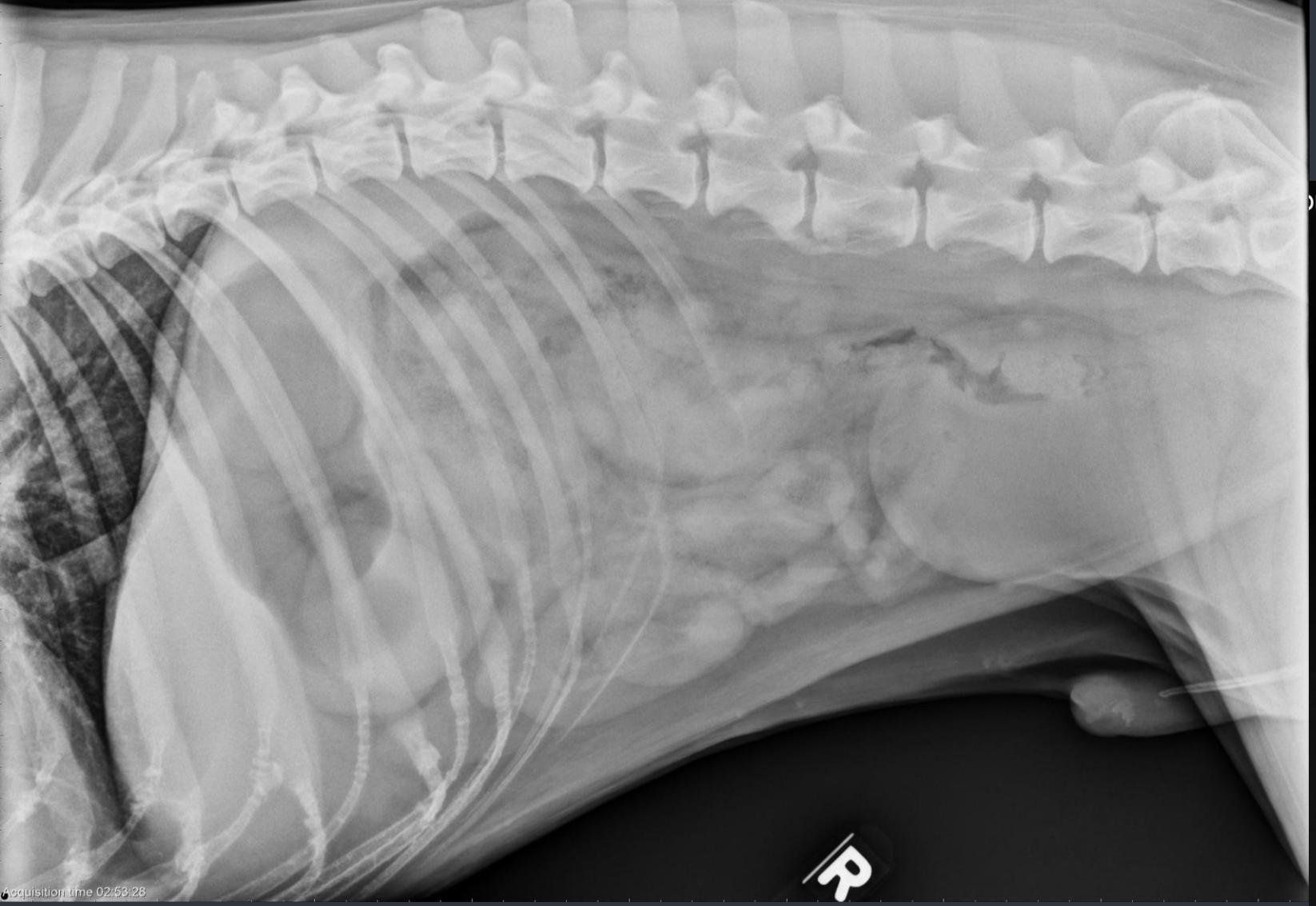
May also be visible in cases of pancreatitis or pancreatic neoplasia



Case Review

Max

- 6 year old neutered male mixed breed dog
- History:
  - Lethargic, vomited once
- Physical exam
  - Within normal limits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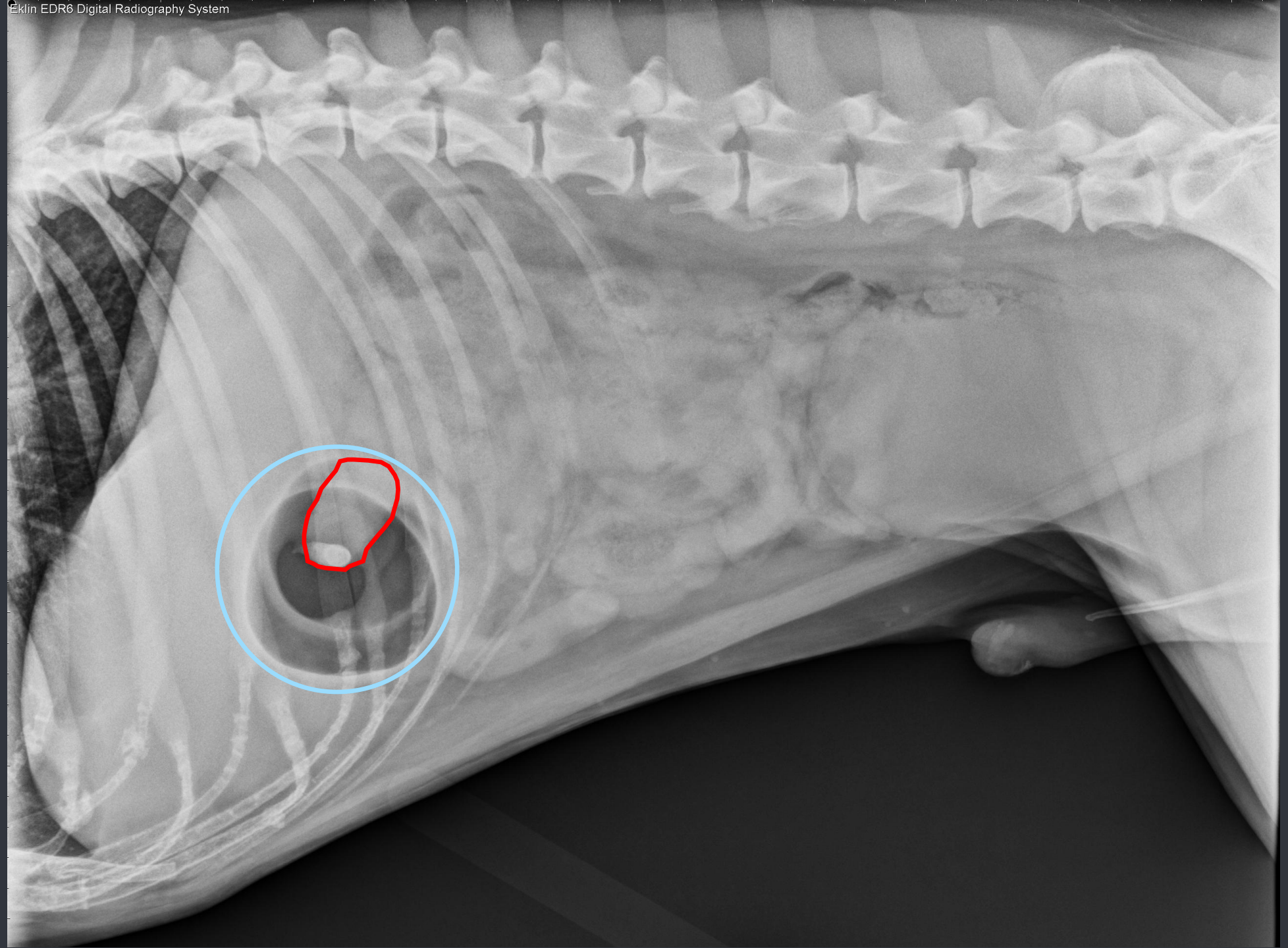

Eklin EDR6 Digital Radiography System

Pyloric outflow obstruction- key take aways

- Always get a left lateral view, to highlight the pyloric outflow tract
  - Ideally, patient should lay in left lateral recumbency on the radiology table for 3-5 minutes
  - Use gas in stomach as a negative contrast agent to our advantage

- To optimize evaluation gastric outflow tract, recommend acquiring left lateral, ventrodorsal, and right lateral views (in that order).

Initial influence of right versus left lateral recumbency on the radiographic finding of duodenal gas on subsequent survey ventrodorsal projection of the canine abdomen. Daniel Hart & Clifford Berry. *Veterinary Radiology and Ultrasound.* 2015;56(1):12-7.

Prospective study of 100 dogs

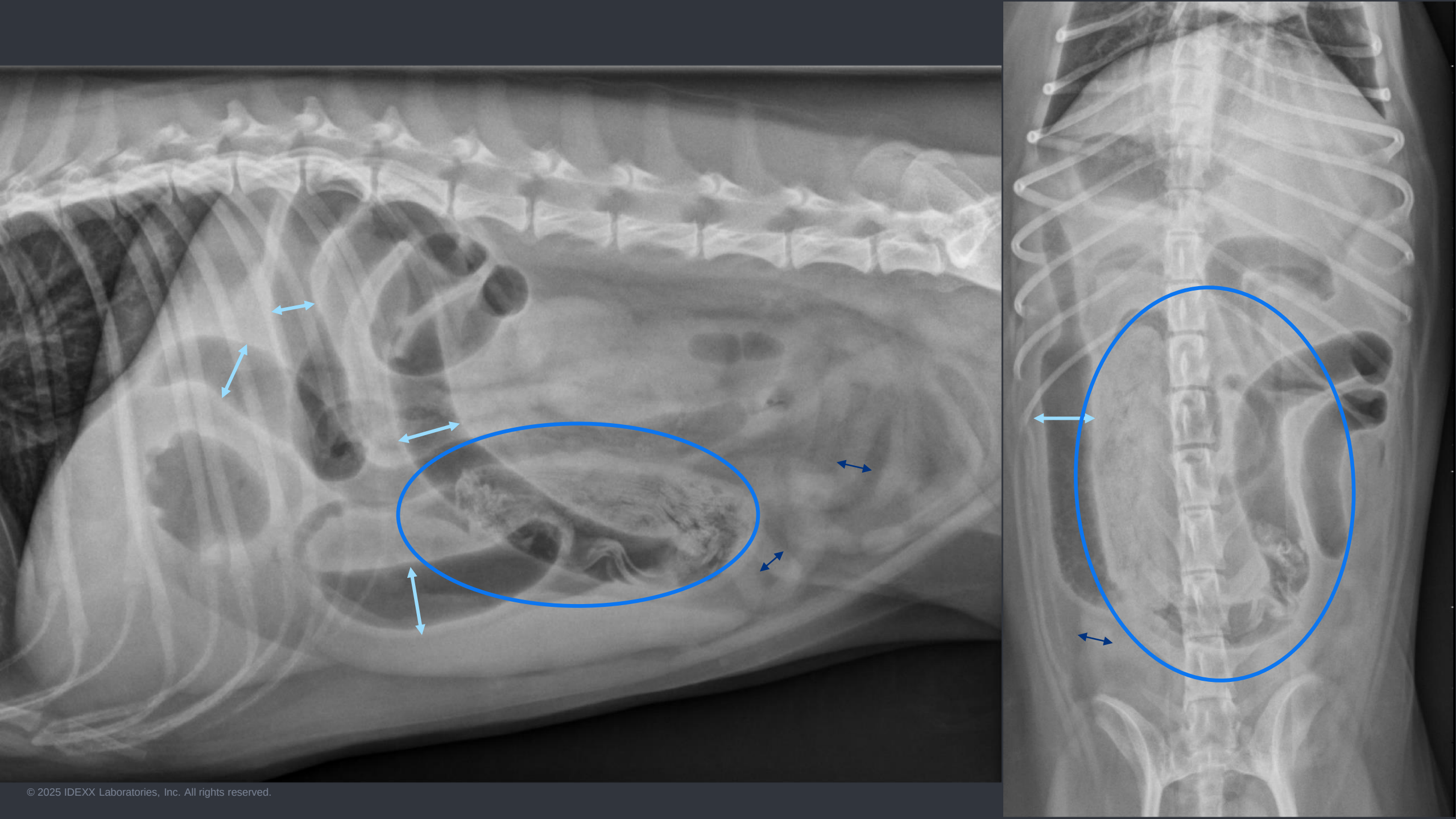
Dogs placed in left lateral recumbency first had more gas in duodenum on VD view

Bella

- 4 year old spayed female Jack Russell Terrier

- History:
  - Vomiting intermittently for the last few days
  - Acute onset of lethargy this morning, now refusing to eat

- Physical exam:
  - Tense and painful abdomen

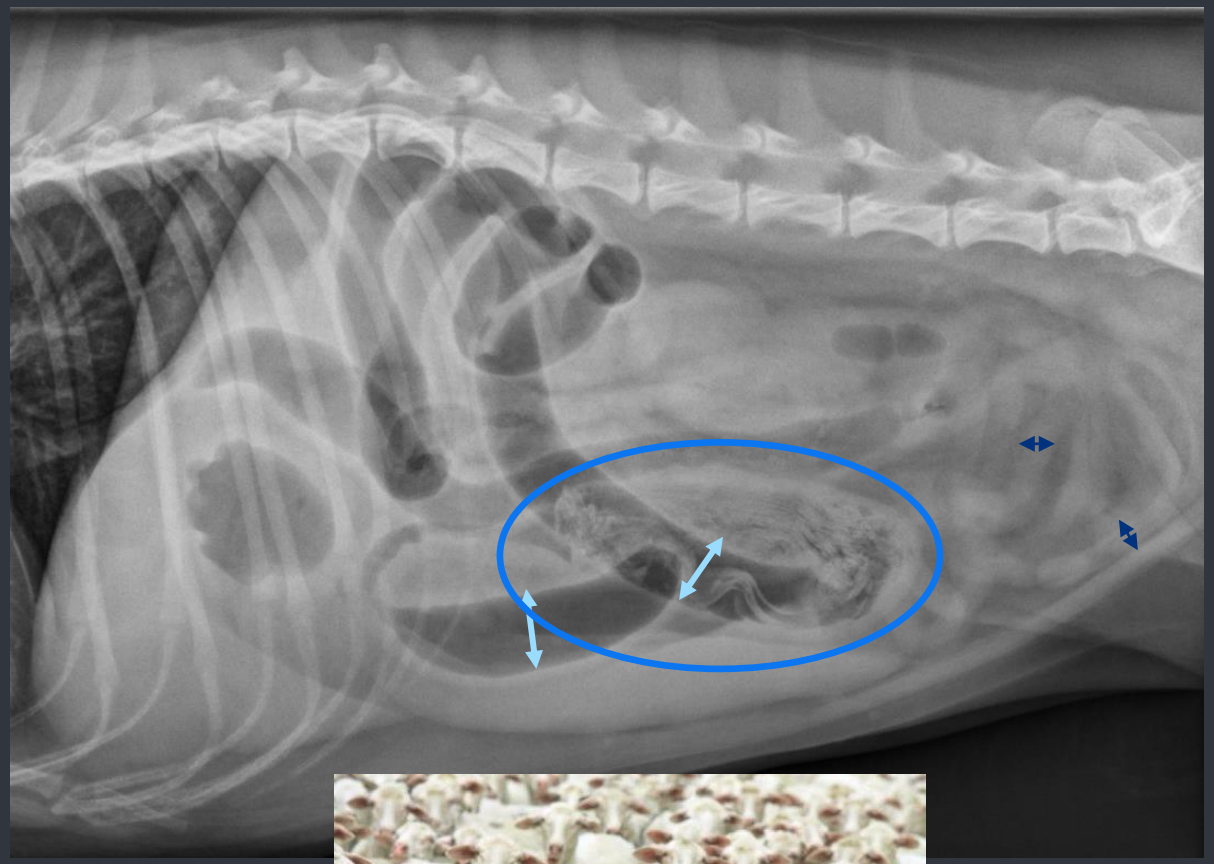


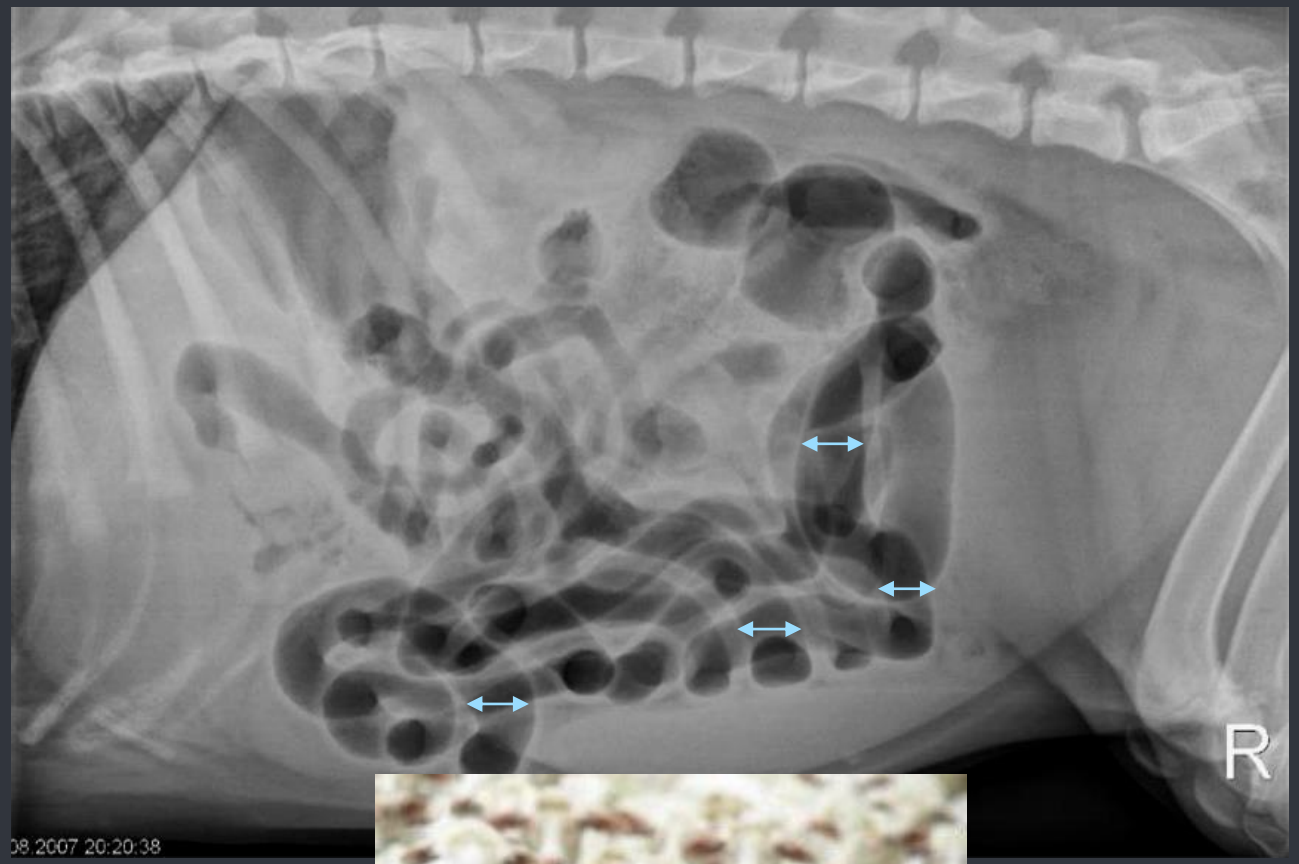
Mechanical Obstruction vs. Functional Ileus

Mechanical obstruction

vs.

Functional ileus



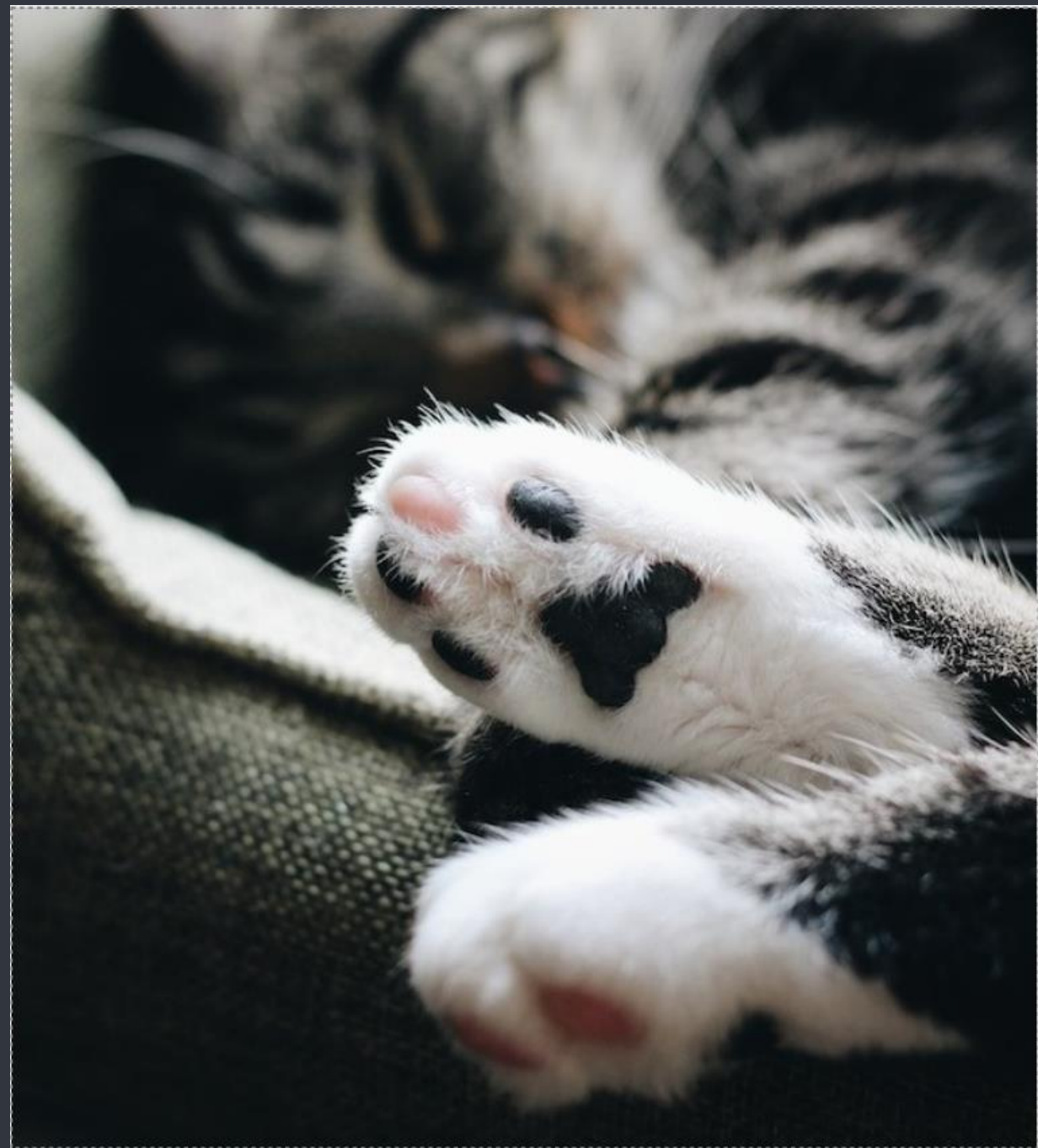


- Bowel loops
  - Variable
- Sometimes,

ns of bowel, mixed popula

on may be visible

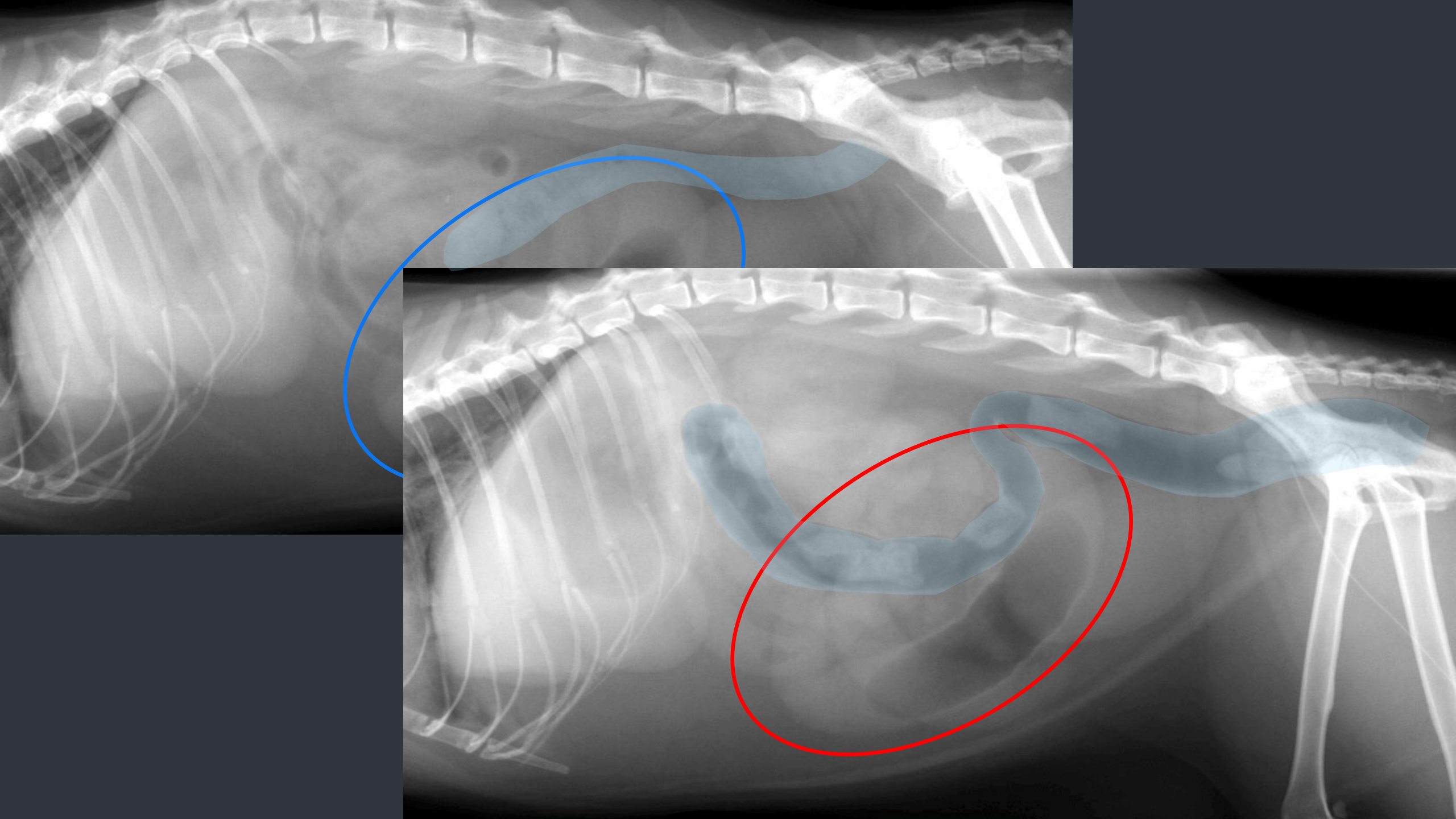
What if it’s hard to tell if a distended segment is small intestine or cecum/colon?



Pneumocolonogram

- Great option if you are unsure if it is colon or distended small intestine
  - Negative Contrast Colonography
- Catheter tip syringe, red rubber
- Room air (slow!)
  - 60-100mL/dog
  - 20-30mL/cat

Image courtesy of Lorrie Gaschen, DVM, DECVDI



Mechanical Obstructions- Key Takeaways

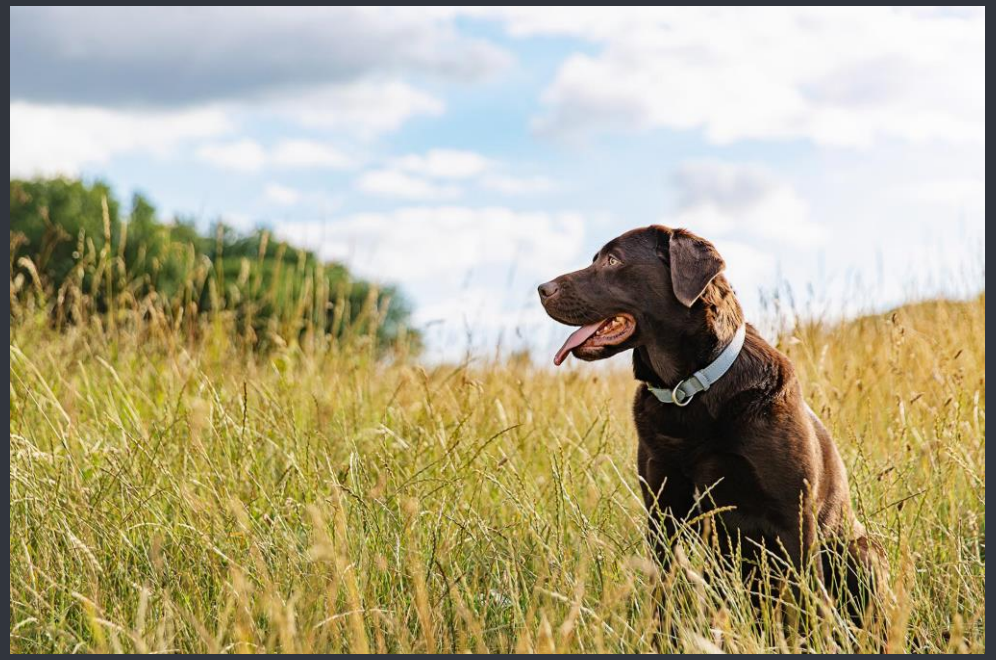
- Evaluate the populations of small intestines (one vs. two)

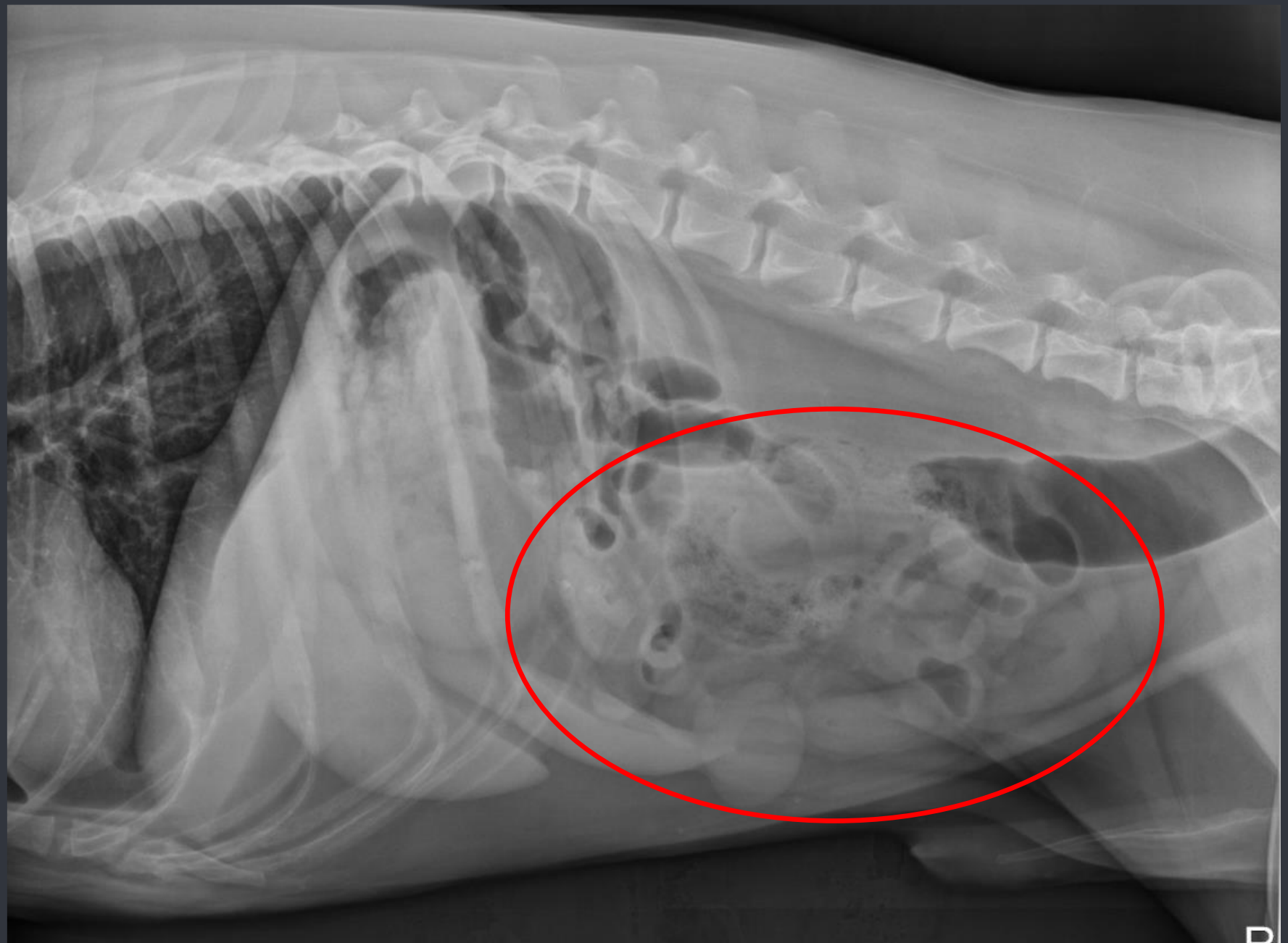
- Be aware of pitfalls
  - Duodenal foreign bodies and vomiting right before imaging may not have the telltale signs of intestinal and/or gastric distention

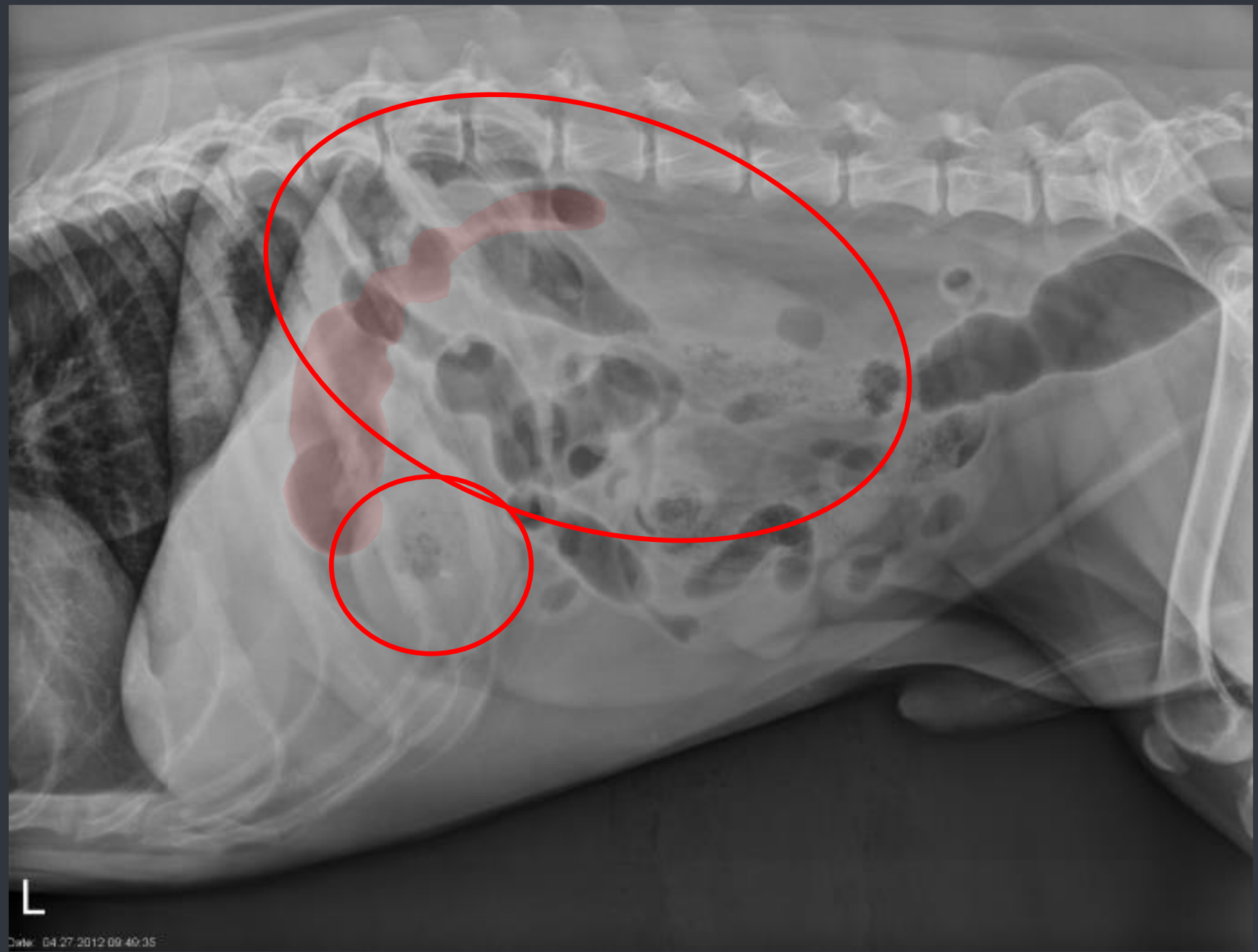
- A pneumocologram can be helpful in distinguishing small intestine vs. cecum/colon

Duke

- 3 year old neutered male Labrador retriever
- History:
  - Presents for vomiting and anorexia x 3 days
- Physical exam:
  - Painful during abdominal palpation



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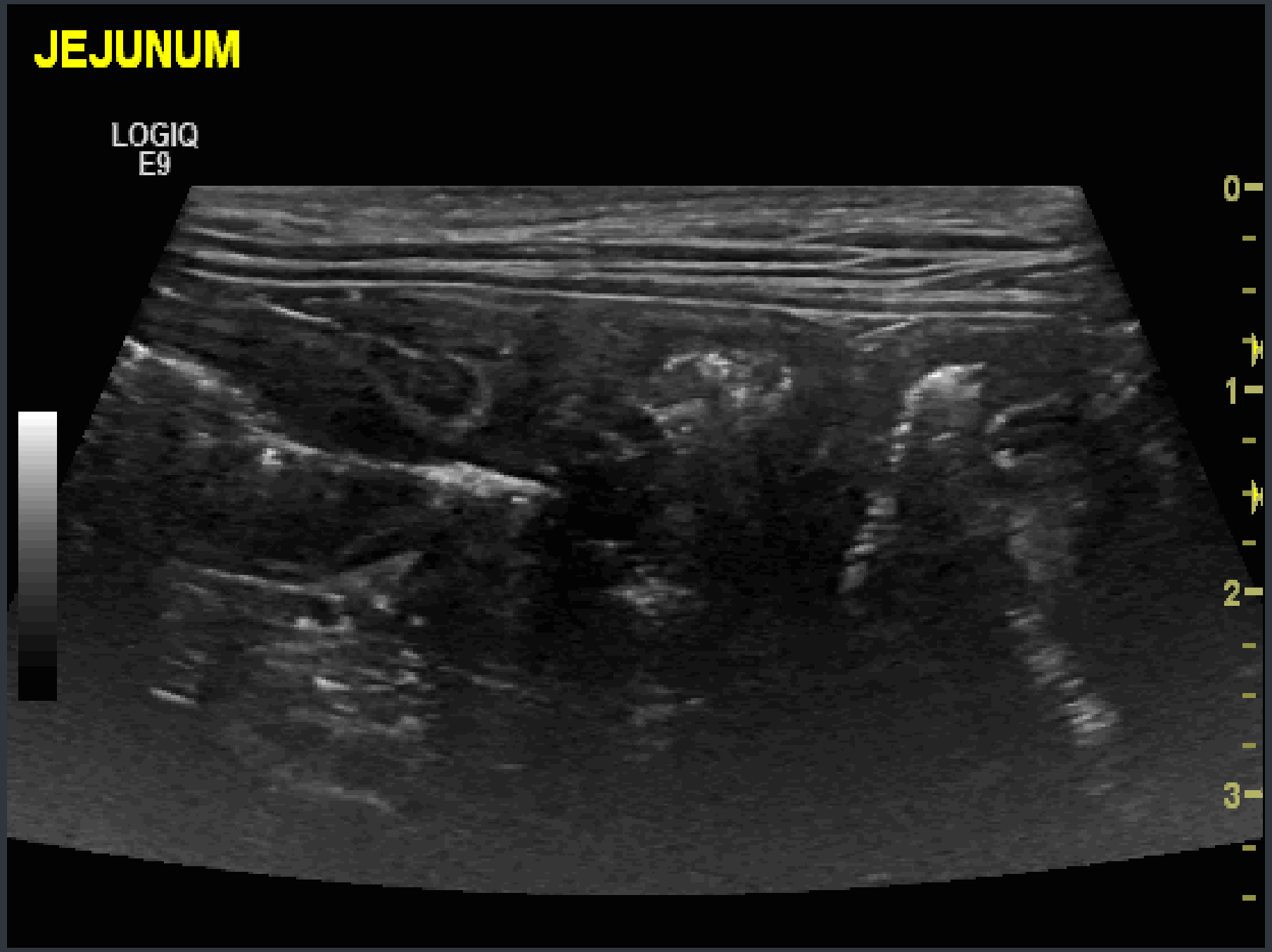


Linear Foreign Bodies

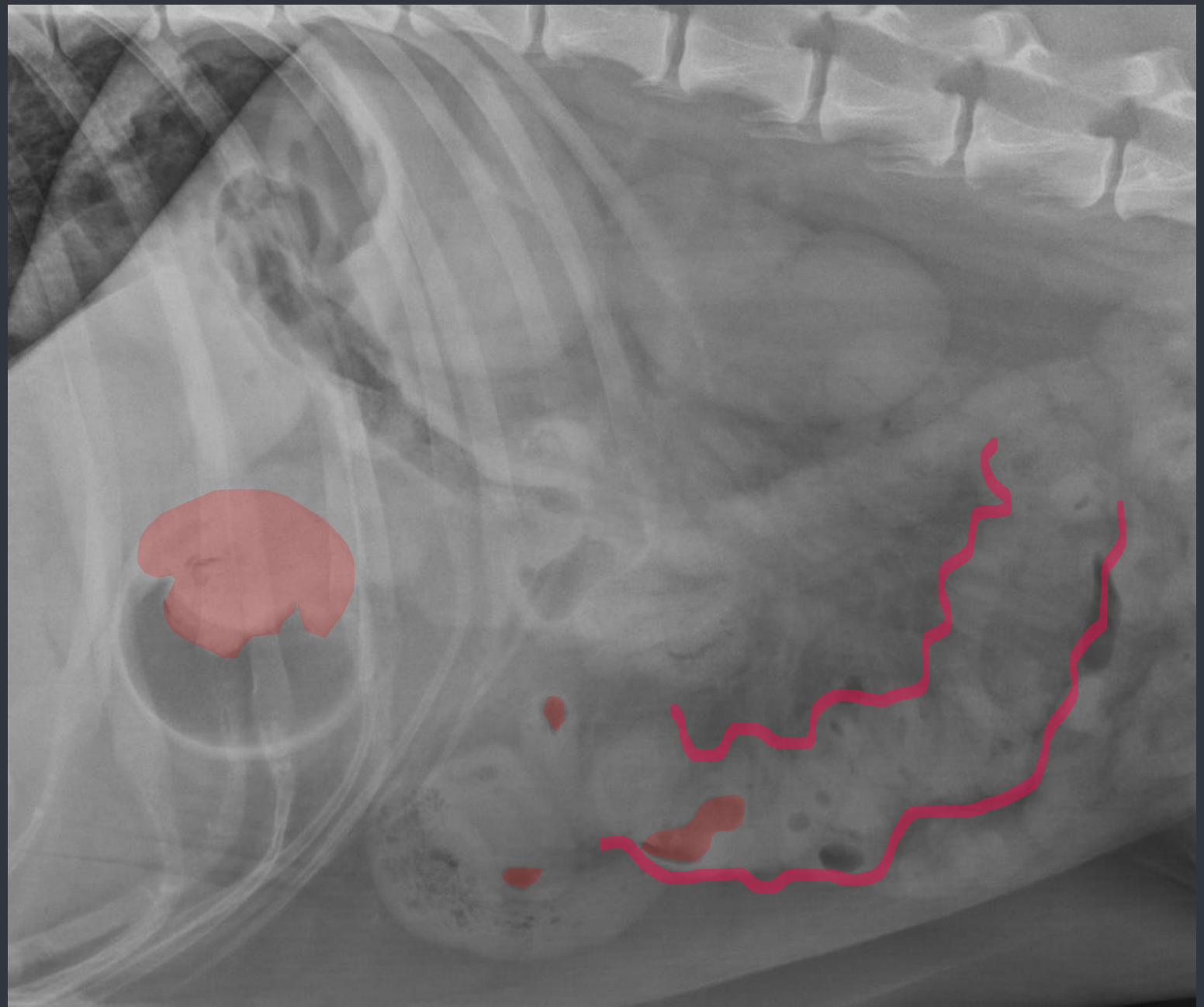
Radiographic features can include:

- Material anchored in pylorus – do a left lateral to evaluate the pylorus!
- Medial deviation of the duodenum on the VD projection
- Loose curling of the small intestinal loops
- Tight plication causing an undulating serosal margins
- Geometric, paisley or triangular shaped gas bubbles

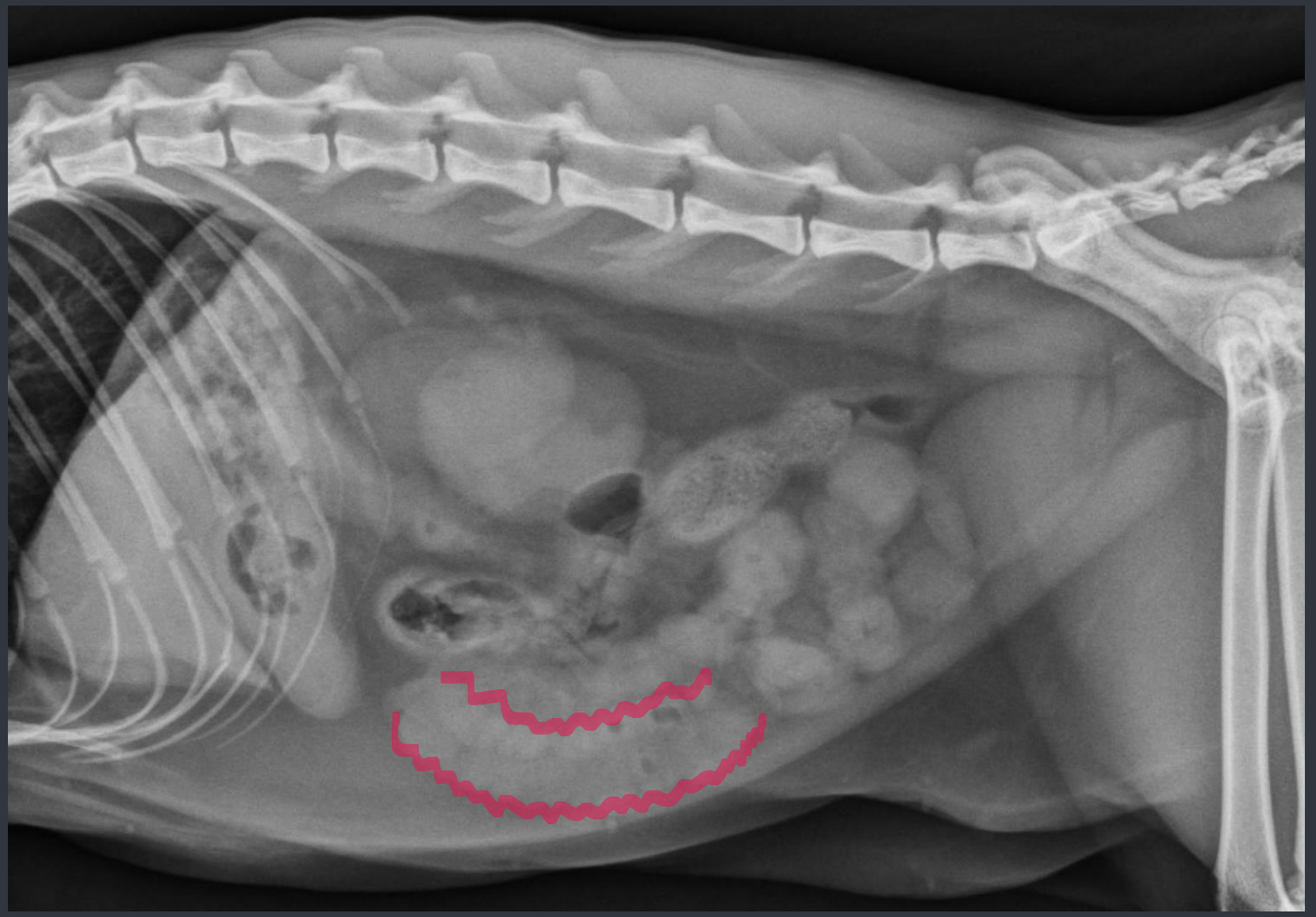
Ultrasound may include:

- Material anchored in pylorus, plications
- Hyperechoic line in lumen

Plication and Atypical Gas Bubbles

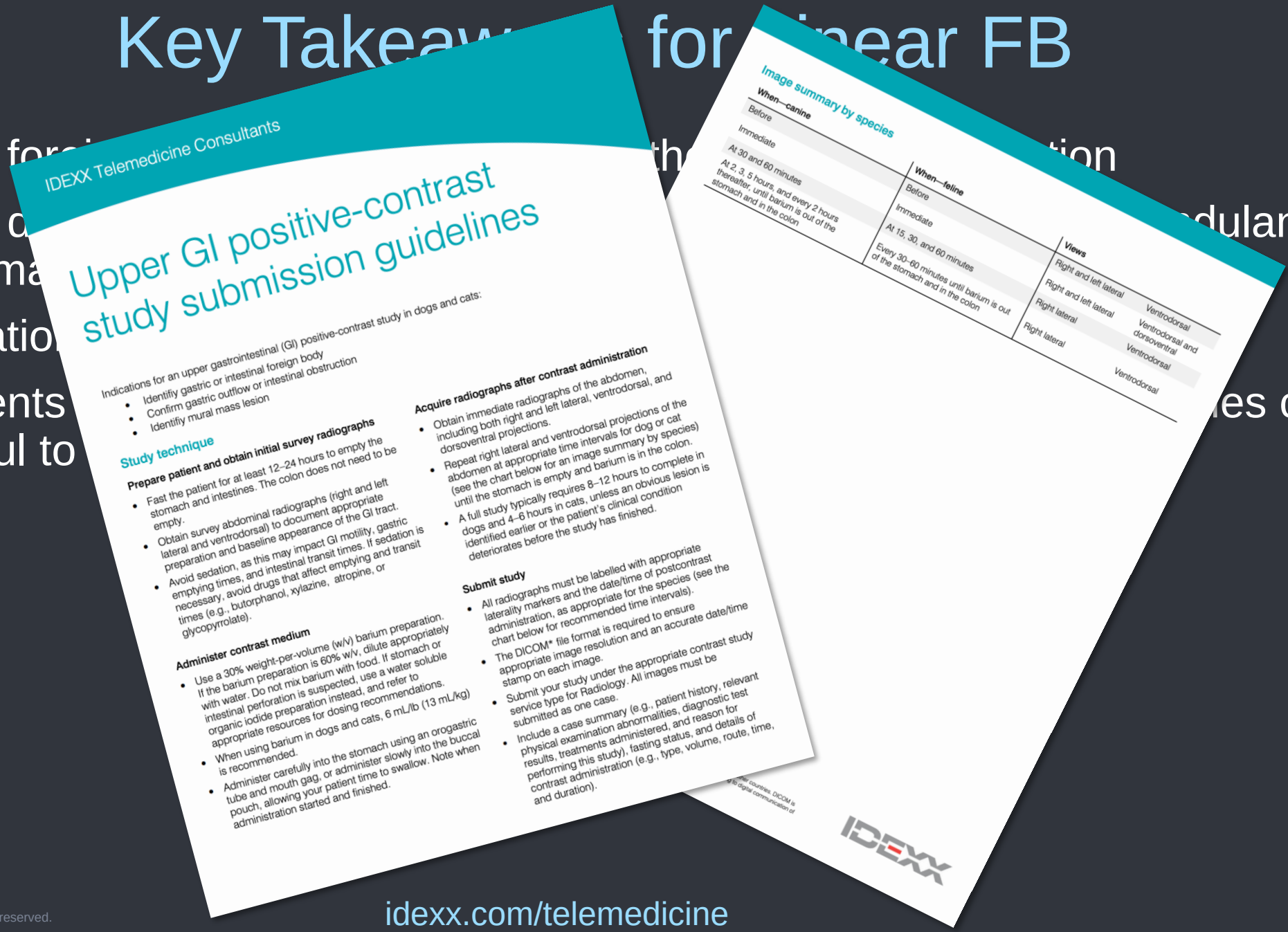


Plication



Key Takeaw for linear FB

- Look for for
- Look for d dulant serosal ma
- Cat plicatio
- In moments es can be helpful to



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Upper GI positive-contrast study submission guidelines

Indications for an upper gastrointestinal (GI) positive-contrast study in dogs and cats:

- Identifiy gastric or intestinal foreign body
- Confirm gastric outflow or intestinal obstruction
- Identifiy mural mass lesion

Study technique

Prepare patient and obtain initial survey radiographs

- Fast the patient for at least 12–24 hours to empty the stomach and intestines. The colon does not need to be empty.
- Obtain survey abdominal radiographs (right and left lateral and ventrodorsal) to document appropriate preparation and baseline appearance of the GI tract.
- Avoid sedation, as this may impact GI motility, gastric emptying times, and intestinal transit times. If sedation is necessary, avoid drugs that affect emptying and transit times (e.g., butorphanol, xylazine, atropine, or glycopyrrolate).

Administer contrast medium

- Use a 30% weight-per-volume (w/v) barium preparation. If the barium preparation is 60% w/v, dilute appropriately with water. Do not mix barium with food. If stomach or intestinal perforation is suspected, use a water soluble organic iodide preparation instead, and refer to appropriate resources for dosing recommendations.
- When using barium in dogs and cats, 6 mL/lb (13 mL/kg) is recommended.
- Administer carefully into the stomach using an orogastric tube and mouth gag, or administer slowly into the buccal pouch, allowing your patient time to swallow. Note when administration started and finished.

Acquire radiographs after contrast administration

- Obtain immediate radiographs of the abdomen, including both right and left lateral, ventrodorsal, and dorsoventral projections.
- Repeat right lateral and ventrodorsal projections of the abdomen at appropriate time intervals for dog or cat (see the chart below for an image summary by species) until the stomach is empty and barium is in the colon.
- A full study typically requires 8–12 hours to complete in dogs and 4–6 hours in cats, unless an obvious lesion is identified earlier or the patient's clinical condition deteriorates before the study has finished.

Submit study

- All radiographs must be labelled with appropriate laterality markers and the date/time of postcontrast administration, as appropriate for the species (see the chart below for recommended time intervals).
- The DICOM* file format is required to ensure appropriate image resolution and an accurate date/time stamp on each image.
- Submit your study under the appropriate contrast study service type for Radiology. All images must be submitted as one case.
- Include a case summary (e.g., patient history, relevant physical examination abnormalities, diagnostic test results, treatments administered, and reason for performing this study), fasting status, and details of contrast administration (e.g., type, volume, route, time, and duration).

Image summary by species

When—canine	When—feline	Views
Before	Before	Right and left lateral
Immediate	Immediate	Right and left lateral, Ventrodorsal
At 30 and 60 minutes	At 15, 30, and 60 minutes	Right lateral, Ventrodorsal and dorsoventral
At 2, 3, 5 hours, and every 2 hours thereafter, until barium is out of the stomach and in the colon	Every 30–60 minutes until barium is out of the stomach and in the colon	Right lateral, Ventrodorsal
		Ventrodorsal

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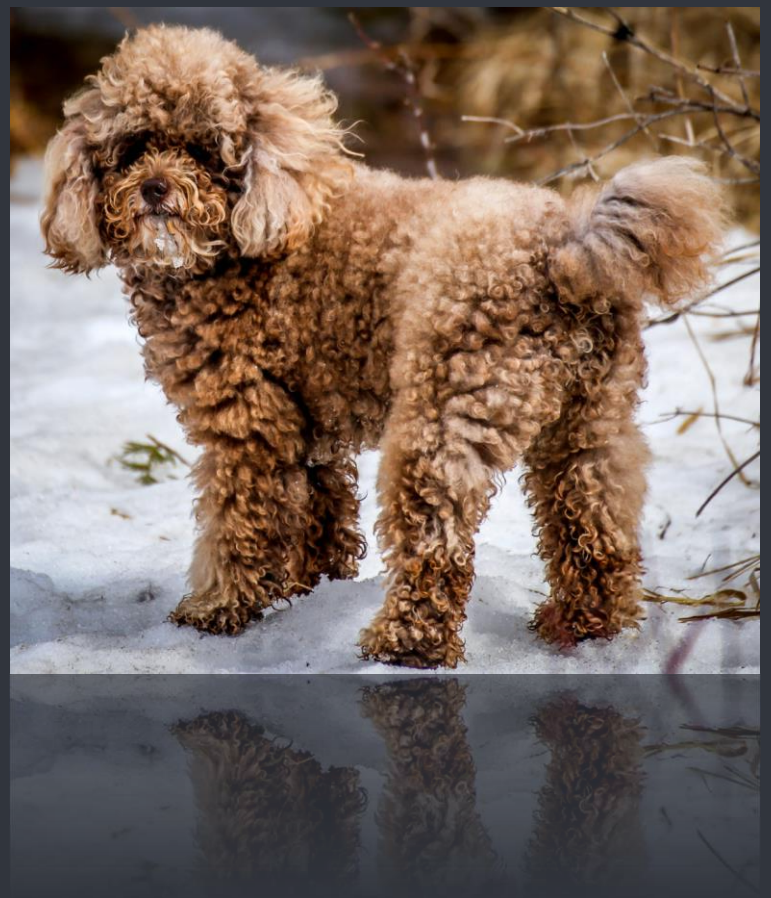
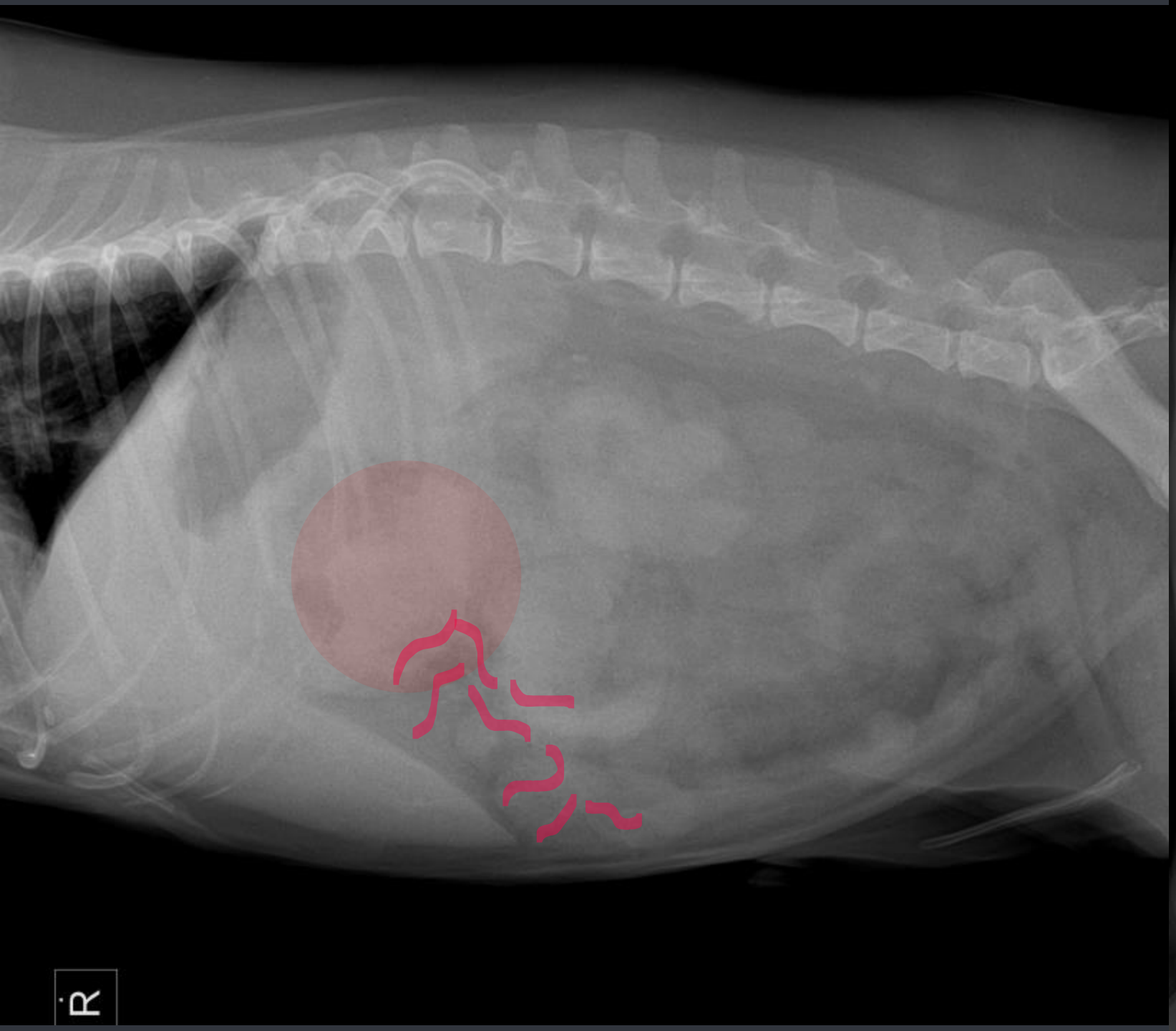
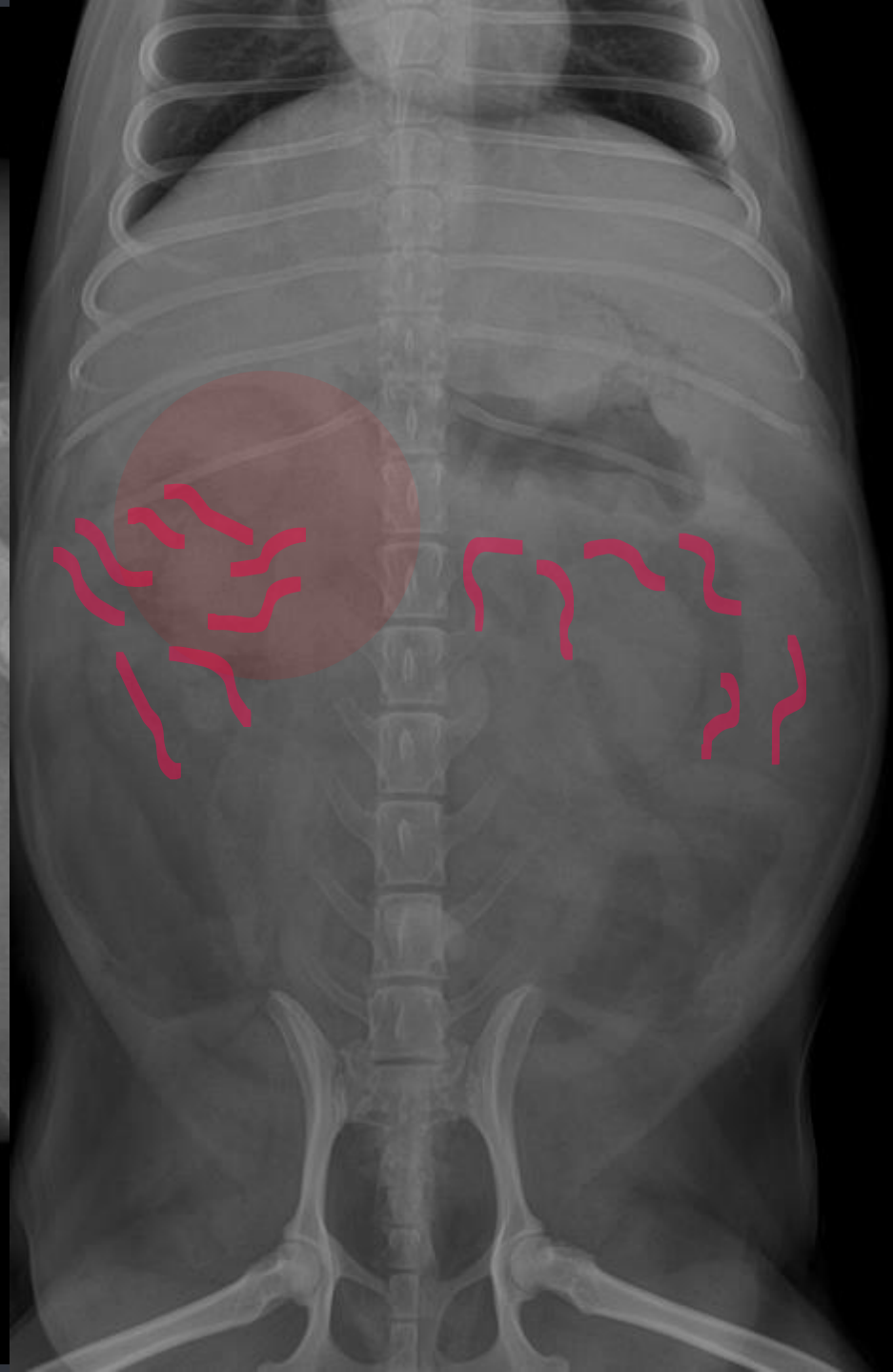
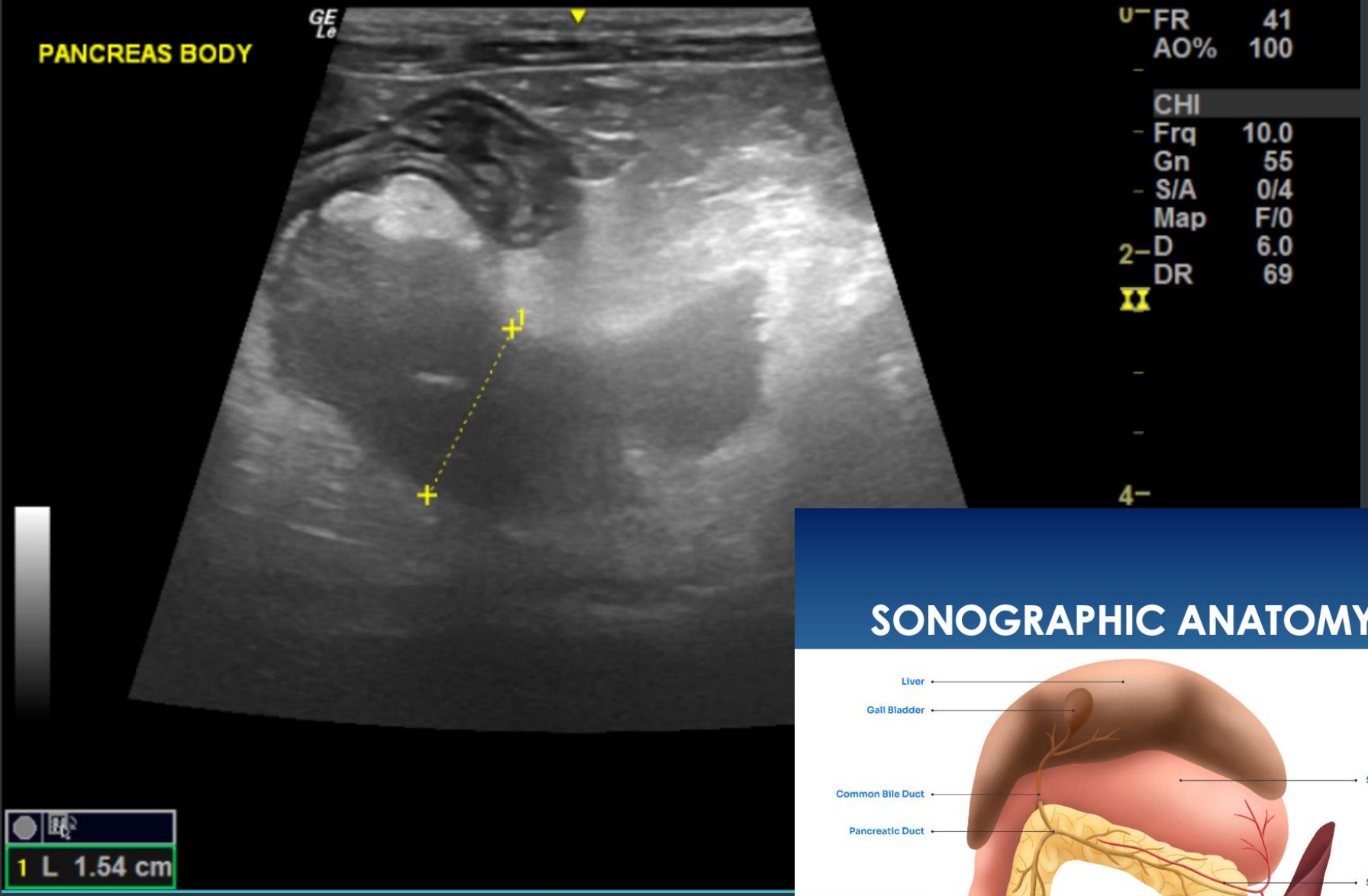
Otis

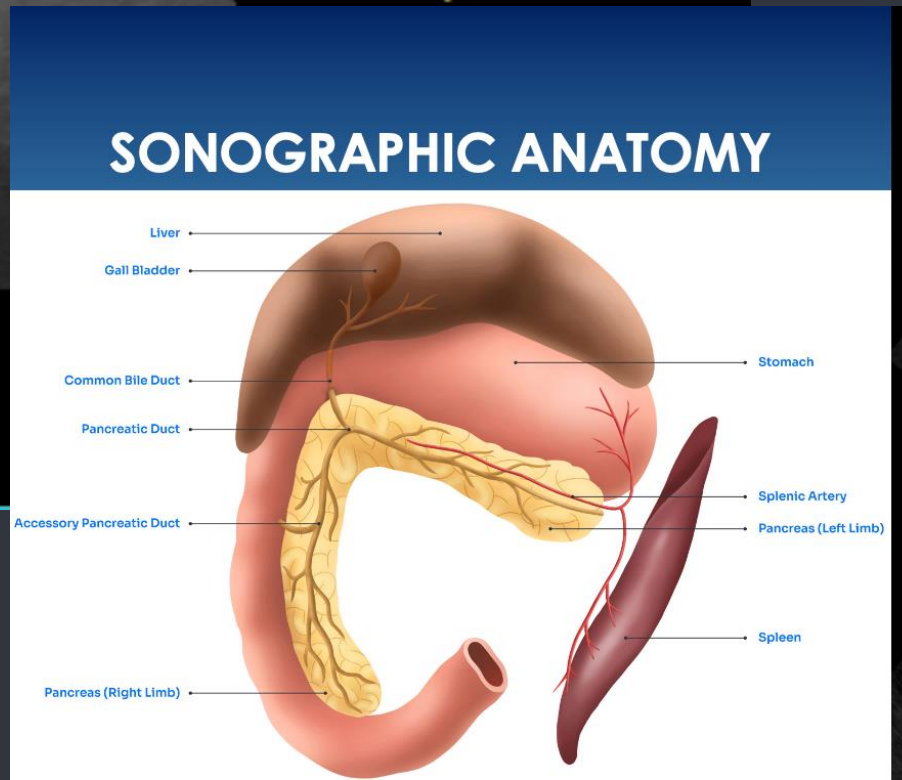
- 12 year old neutered male miniature poodle
- History:
  - Lethargy, inappetence, vomiting, diarrhea x 2 weeks
  - History of garbage ingestion
- Physical exam:
  - Restless, painful abdominal palpation

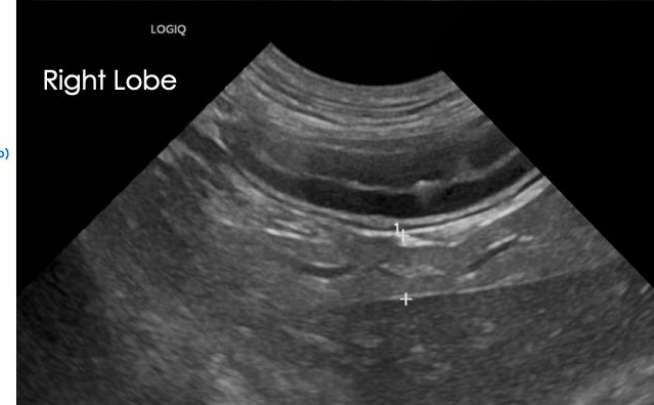












Acute Pancreatitis

- Additional Diagnostics
  - Serial US
  - CT
  - Catalyst® Pancreatic Lipase Test
  - Snap cPL
  - Biochem, UA, Cystatin B (AKI)
- Therapeutics
  - Fluid therapy
  - Analgesia
  - Vomiting, nausea control
  - Enteral nutrition within 48 hours
  - PANOQUELL®-CA1

Take Home Messages

- Key Imaging Tips:
  - Always get a left lateral view!
    - Pyloric outflow obstructions
    - Anchored linear foreign bodies
  - Assess the populations of small intestines to help identify mechanical obstructions
  - Ultrasound may be beneficial and compliment radiographic findings in some patients
- Correlate imaging findings with the patient's clinical presentation

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Questions?