Hepatobiliary Anatomy Review & Diagnostic Imaging

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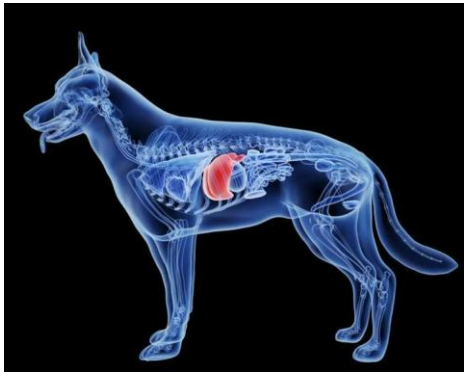
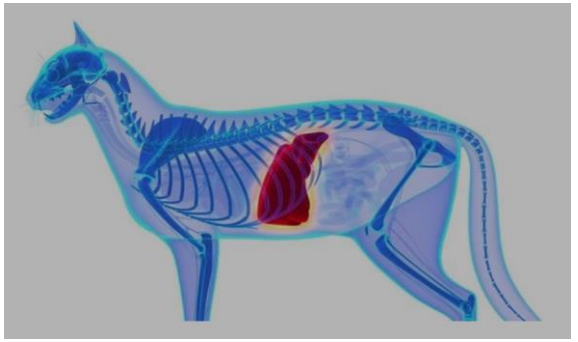


Introduction

Canine & Feline



- The hepatobiliary system includes the liver, gallbladder, bile ducts, and associated vasculature
- It plays a vital role in metabolism, detoxification, digestion, and excretion
- Imaging techniques are crucial for helping to diagnose hepatobiliary diseases in small animals & our ZooMed patients

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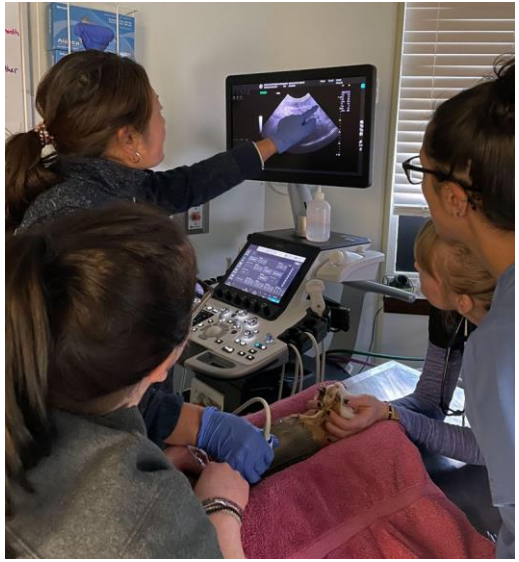
Don’t forget ZooMed; they have liver disease too!

Ferrets, Bearded Dragons, Lizards, Rabbits



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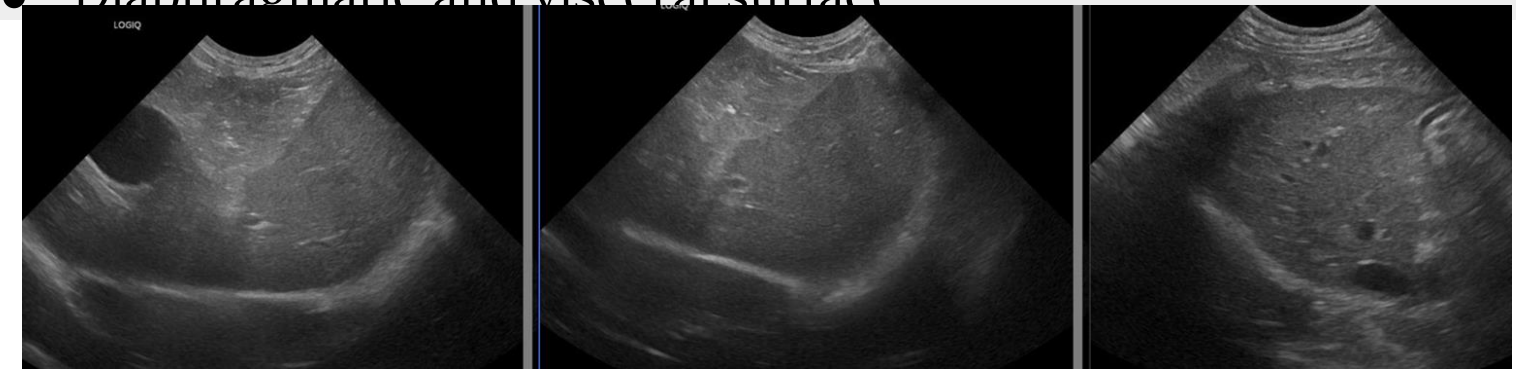
LIVER

- Largest internal organ of the body; largest exocrine and endocrine gland
- Average of 3.38% body weight [adult mongrel dogs, both sexes]
- Fresh liver, deep red color, firm yet friable
- 30 lb dog, dorsal to ventral (14 cm) x width (12 cm) x thickness (6 cm)
- Diaphragmatic and visceral surface



Miller and Evans Anatomy of the Dog

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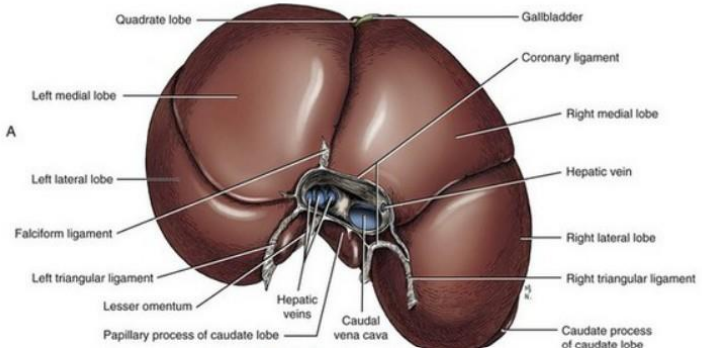
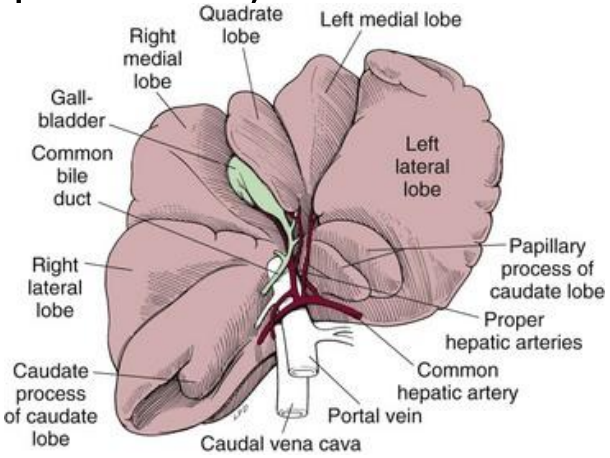
LIVER lobes

Divided into 4 lobes, 4 sub-lobes & 2 processes [unequal size]

- Left (medial and lateral)
- Right (medial and lateral)
- Quadrate
- Caudate (caudate and papillary processes)





Miller and Evans Anatomy of the Dog

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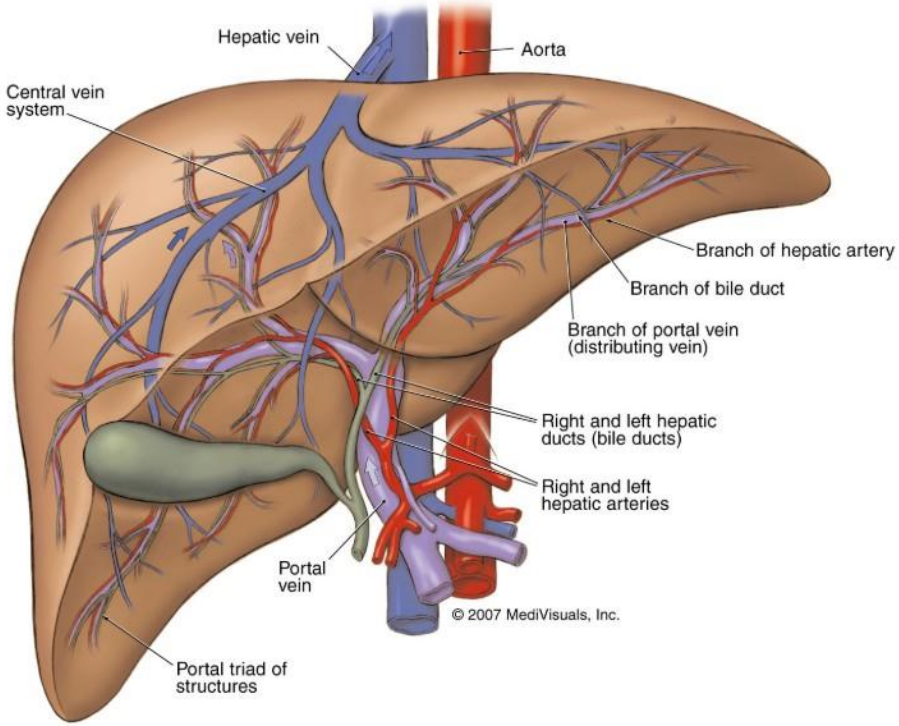
LIVER: dual vascular supply



Hepatic artery (oxygenated & nutritional blood)

⅕ blood entering liver (25%)

Portal vein (nutrient-rich blood from stomach, intestines, pancreas, spleen)

⅘ blood entering liver (75%)

Hepatic veins (drain into caudal vena cava)

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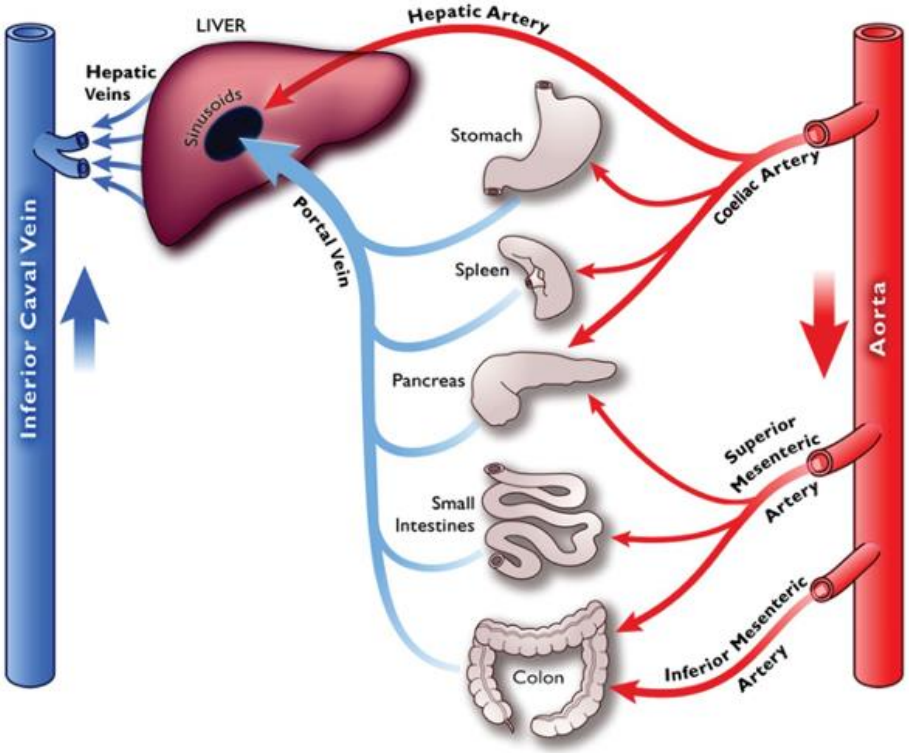
LIVER: vascular supply



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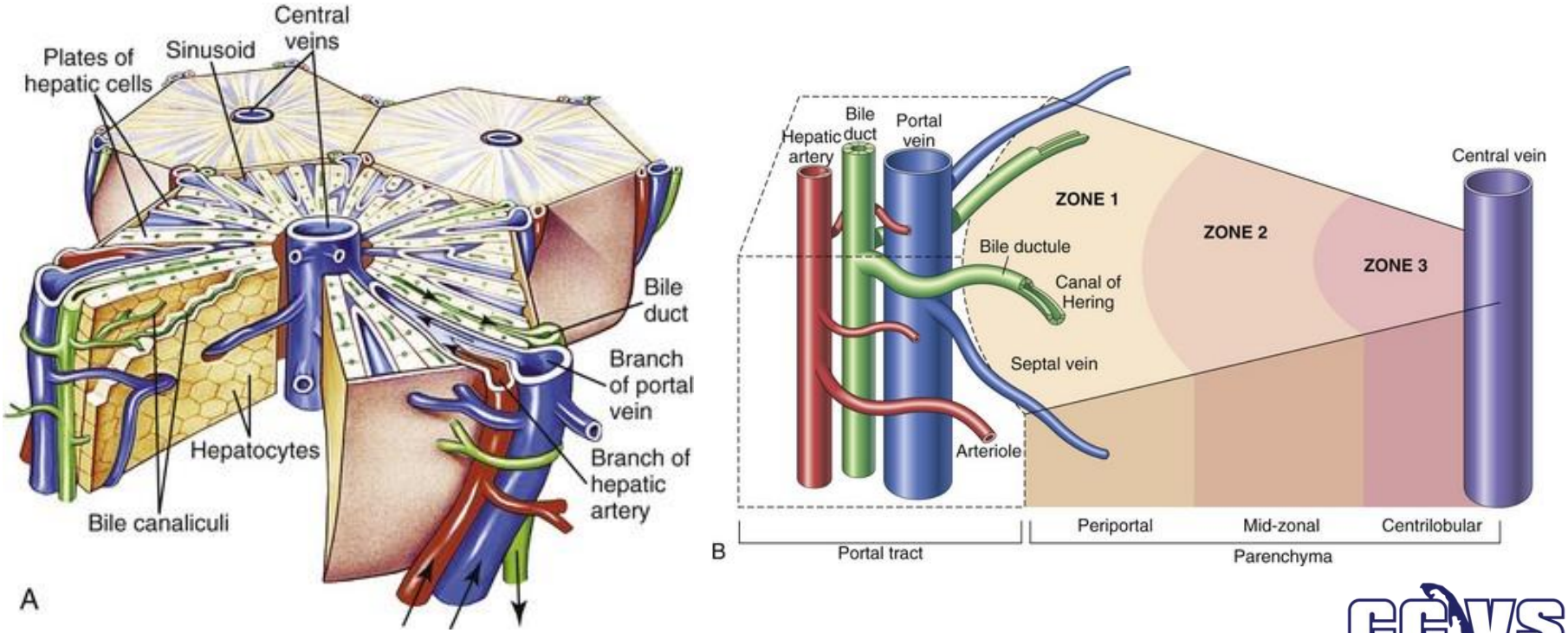
LIVER sinusoids



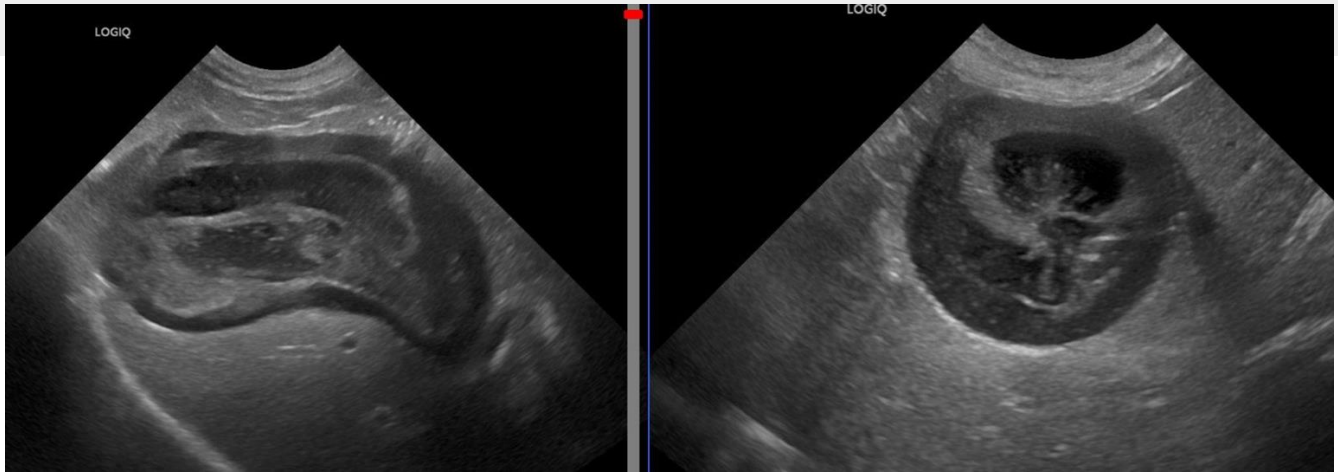
Gallbladder

Location: Between right medial and quadrate lobes

Function: Stores and concentrates bile

Biliary Tree:

- Hepatic ducts → Cystic duct → Common bile duct → Duodenum (major duodenal papilla)



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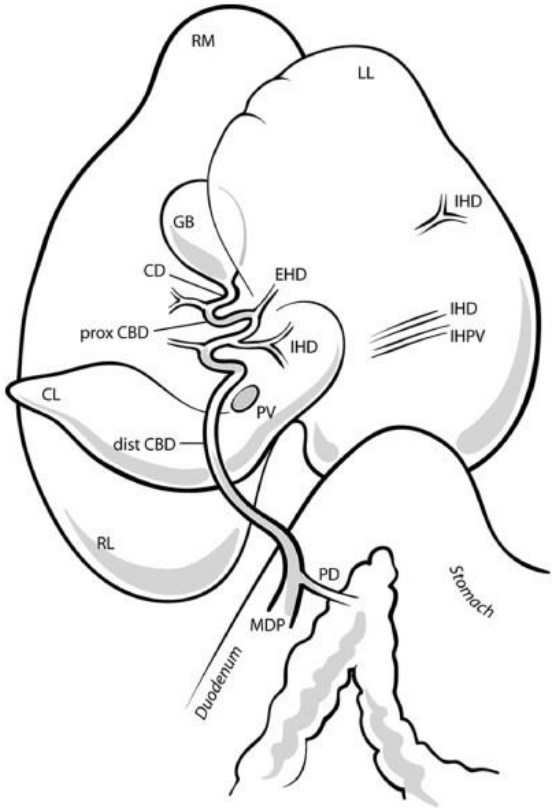
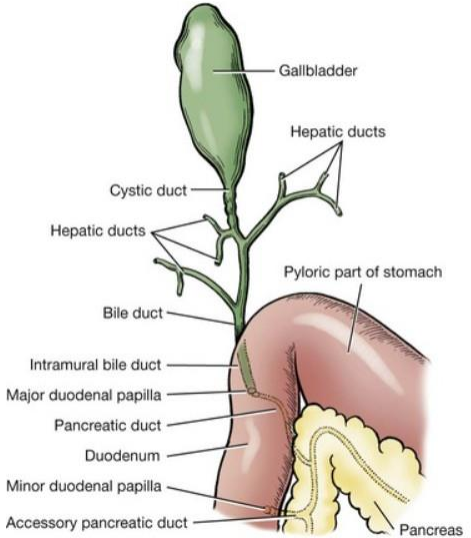
Gallbladder in Cats



- Common bile duct and pancreatic duct merge before entering the duodenum
- Gallbladder disease (e.g., mucocele) is less common



Researchgate.net, Miller and Evans Anatomy of the Dog

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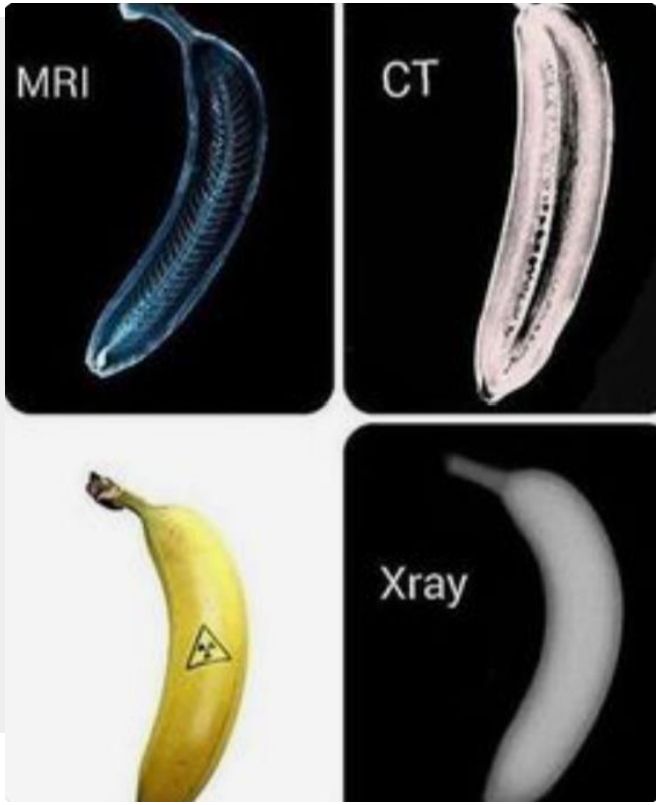
Types of Diagnostic Imaging Modalities

- X-ray (radiography)
- Computed Tomography (CT)
- Magnetic Imaging Resonance imaging (MRI)
- Ultrasound



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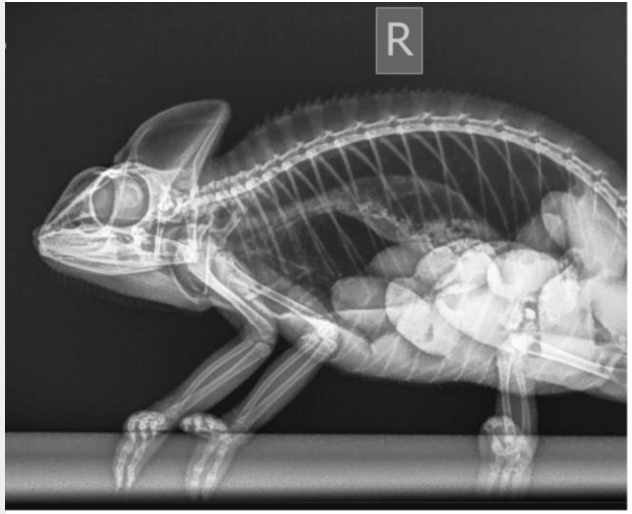
X-Ray Imaging

Principle: Use of ionizing radiation to create imaging of internal structures

Common Uses: Bone fractures, chest imaging (eg.pneumonia, heart failure)

Strengths: Fast, inexpensive, widely available

Limitations: Limited soft tissue detail, radiation exposure



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Hepatic Radiography

Uses: Assess liver size, shape, and position

Findings:

- Hepatomegaly: Rounded margins, displacement of gastric axis caudally
- Microhepatica: Cranial displacement of gastric axis
- Gallbladder calculi may be visible if mineralized

Limitations: Limited soft tissue contrast; bile ducts not well visualized

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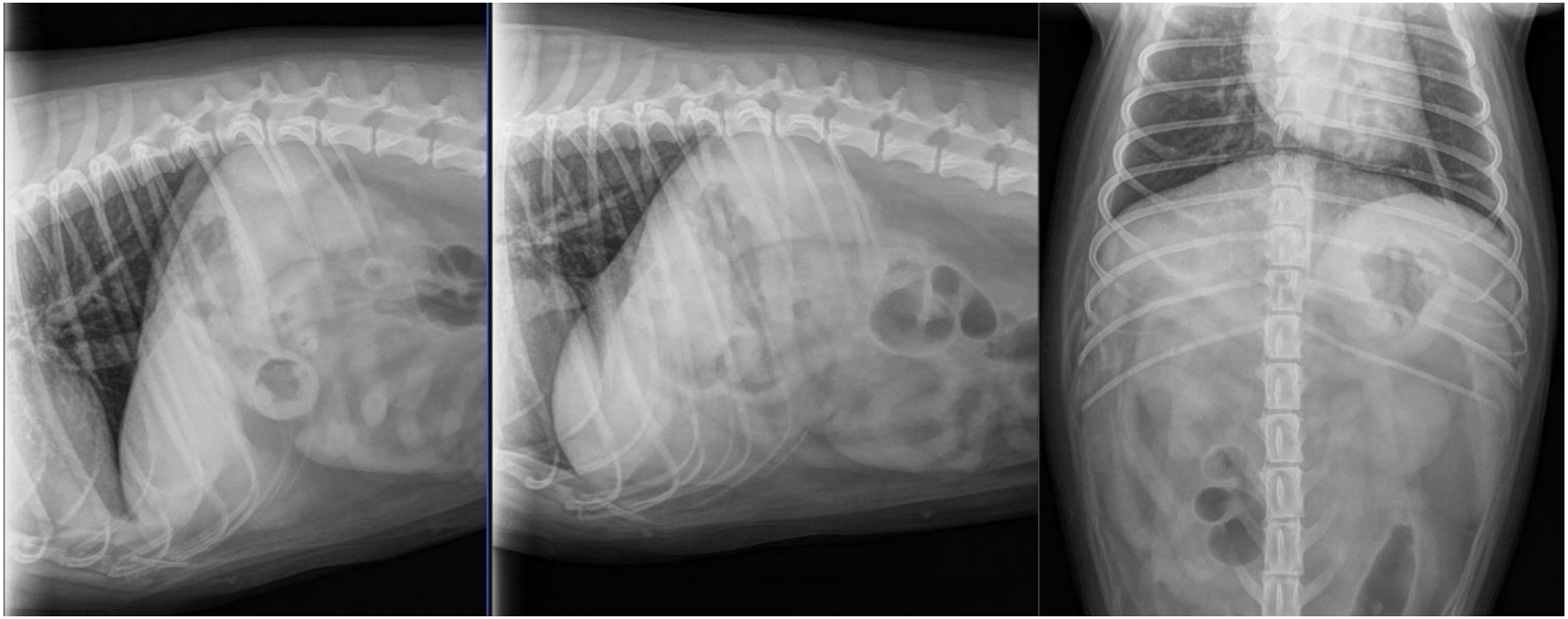
Radiography



Location: Cranial abdomen, extending from the diaphragm caudally.

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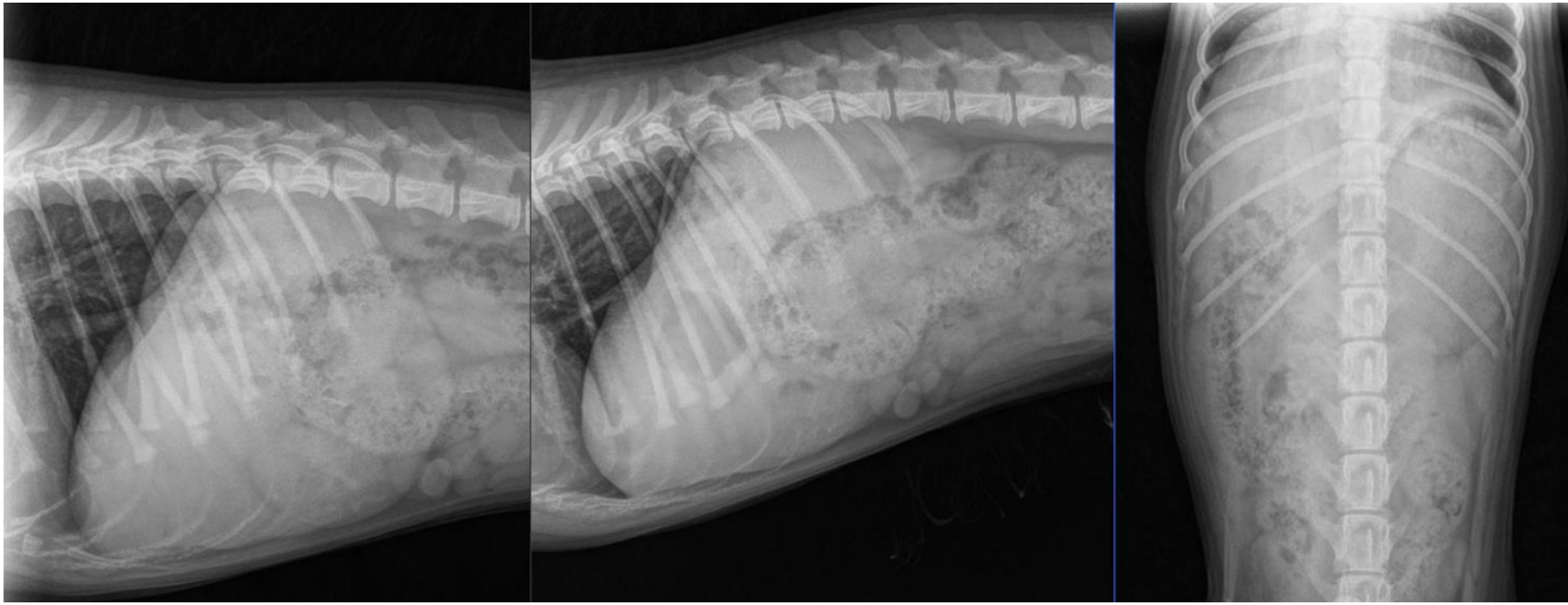
Radiography



Full stomach

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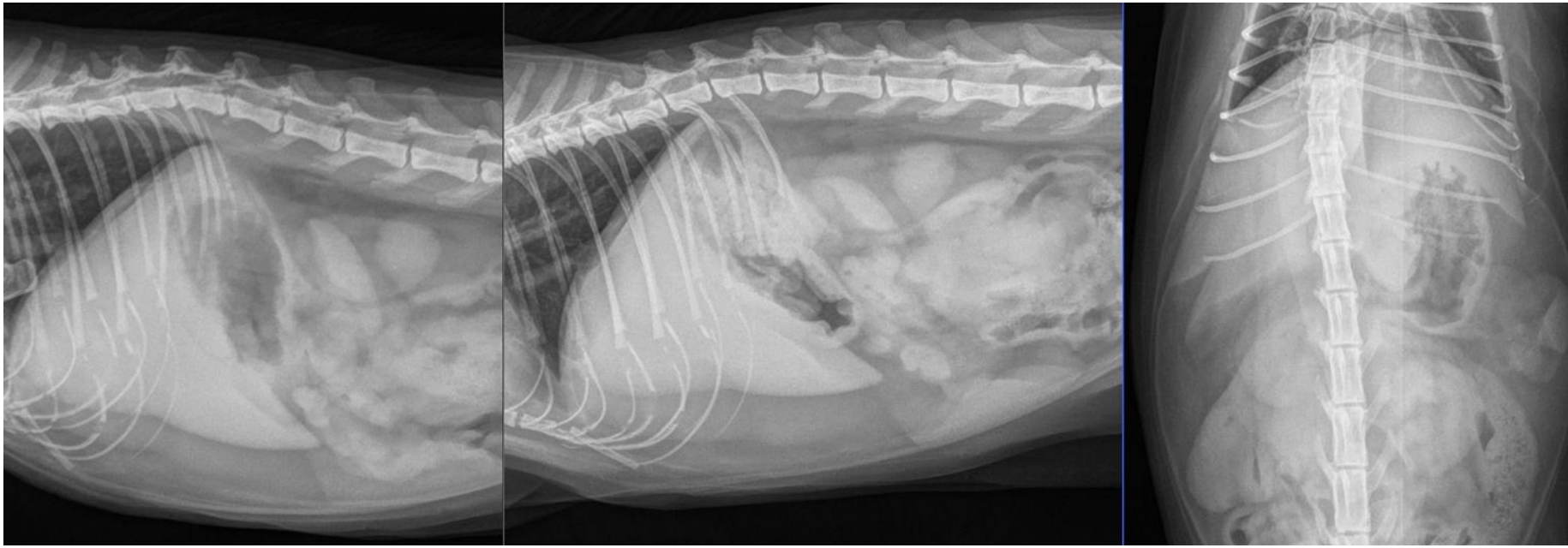
Radiography



Feline Hepatomegaly

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Ultrasound Imaging

Principle: Uses high-frequency sound waves to produce real-time images of soft tissues

Common Uses: Abdominal imaging, cardiology, musculoskeletal imaging

Strengths: Non-invasive, no radiation, portable, real-time imaging

Limitations: Limited penetration for deep tissues, operator-dependent

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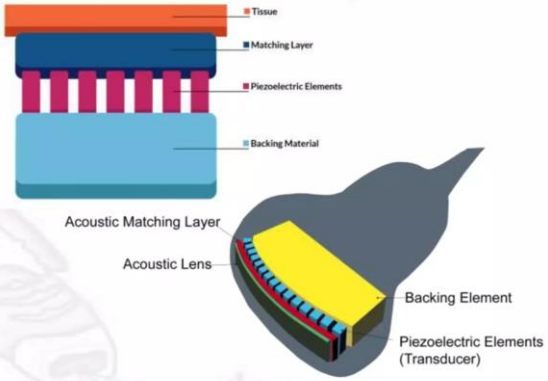
Ultrasound Probe: the Workhorse

Matching Layer

- Purpose: A matching layer, often made of a resin-based material, helps to optimize sound wave transmission between the transducer and the patient's skin by reducing impedance mismatch.



Ultrasonography

Advantages: Non-invasive, real-time imaging of liver parenchyma, vessels, and biliary system

Findings:

- Hyperechoic lesions: Fibrosis, lipidosis, neoplasia
- Hypoechoic lesions: Abscesses, cysts, neoplasia
- Gallbladder: Mucocele (kiwi pattern), sludge, cholelithiasis.
- Bile Duct Dilation: Suggestive of obstruction

Doppler US: Evaluates vascular flow (portal hypertension, shunts)

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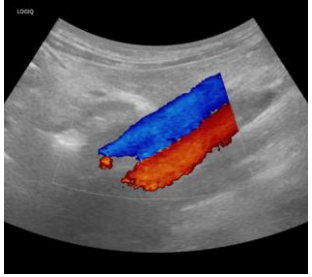

Doppler US

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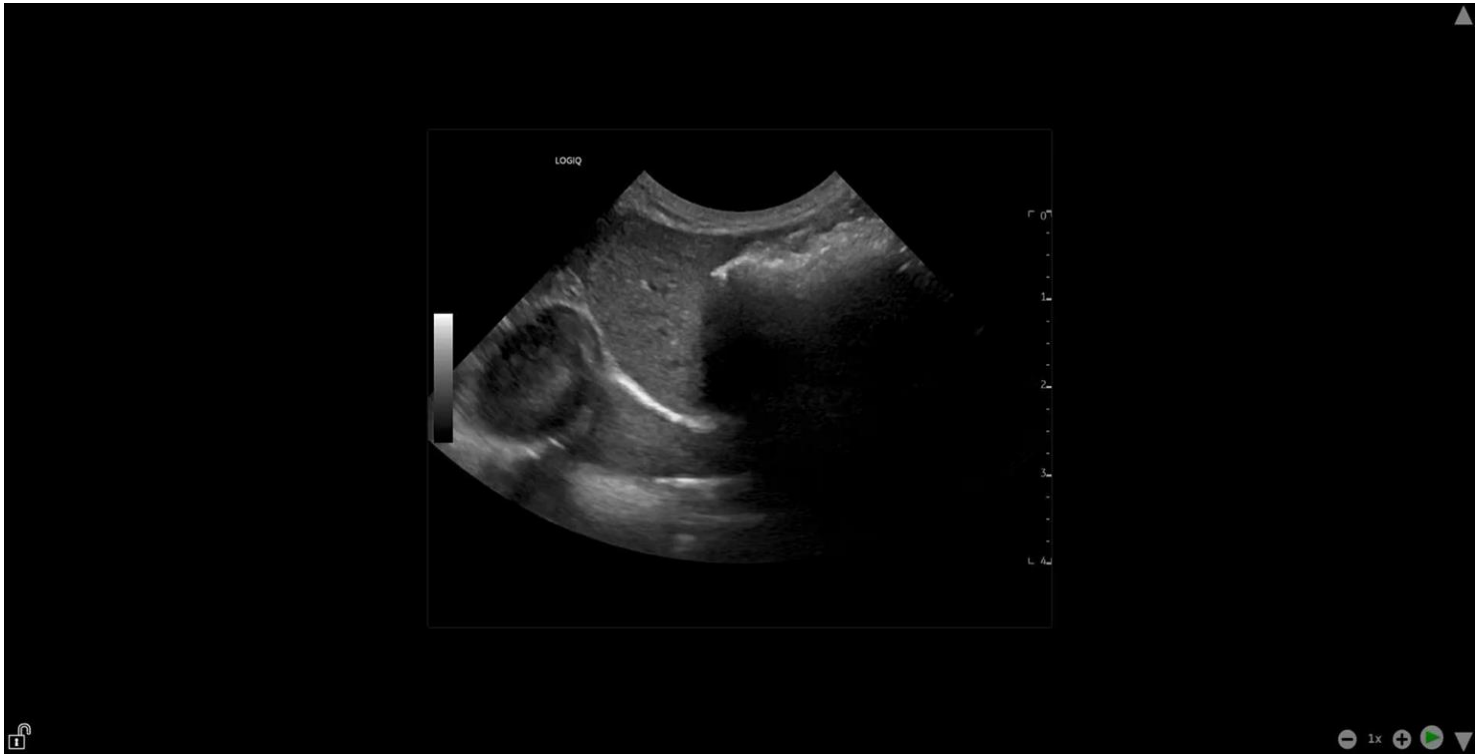
Hepatic Ultrasonography



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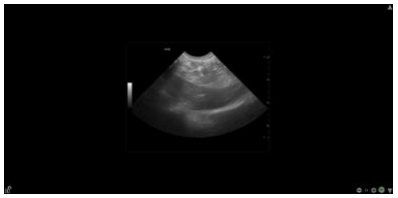
US challenges



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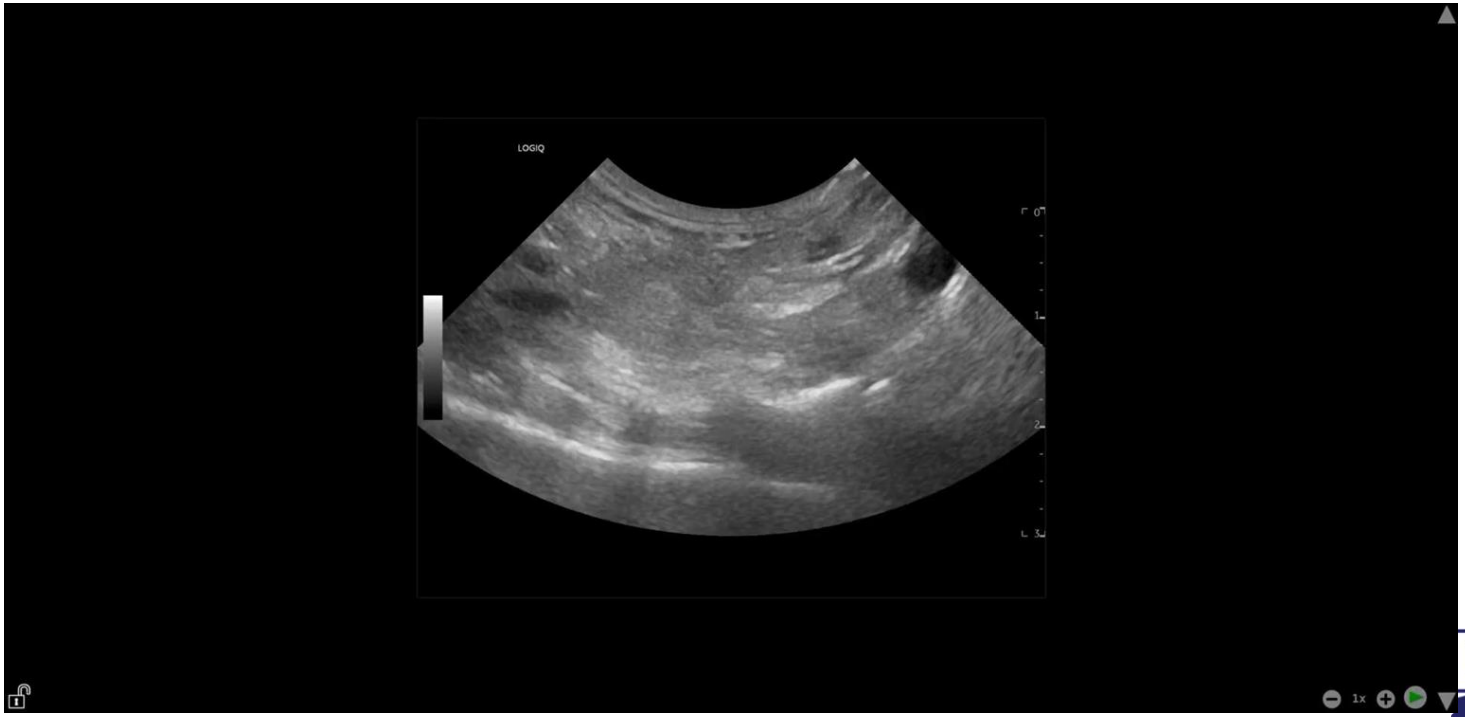
US guided sampling

Fine needle aspiration & Tru Cut biopsy



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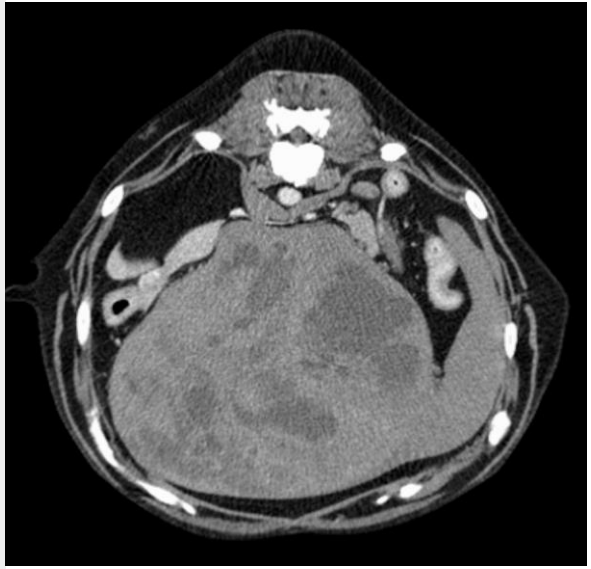
CT Imaging: Computed Tomography

Principle: Combination of x-ray images from different angles and computer processed, creates 3D images

Common Uses: Detail imaging of body, including organs, bones and blood vessels

Strengths: Detailed images, fast, and for complex cases

Limitations: Higher radiation compared to x-rays



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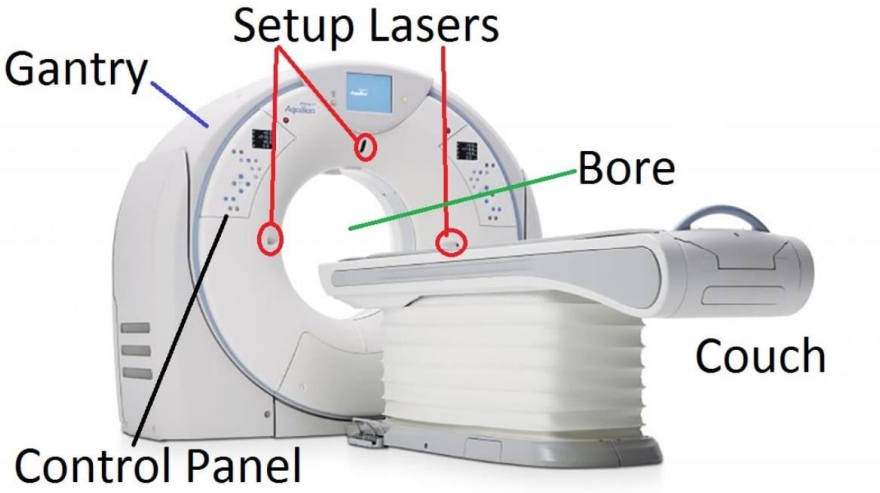
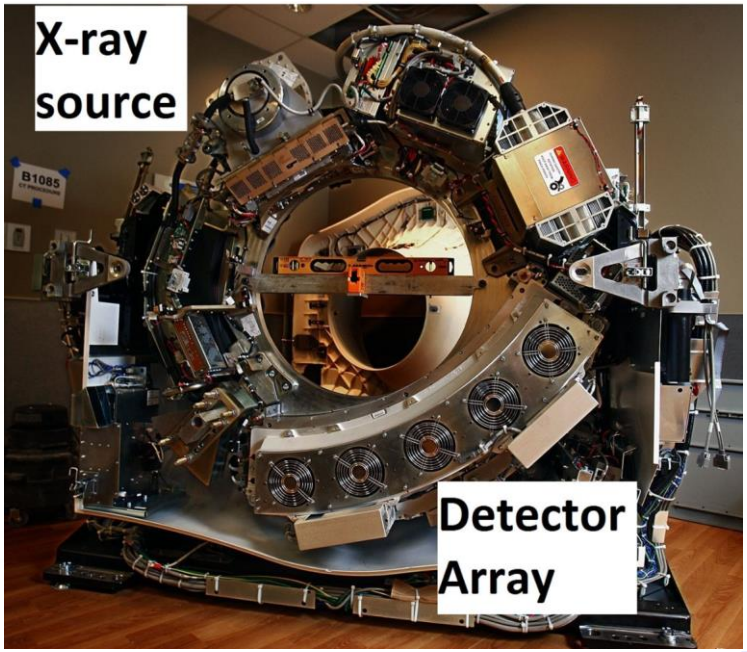
CT Imaging equipment





Computed Tomography (CT)

Uses:

- Detailed liver parenchyma assessment
- Detection of hepatic masses, vascular anomalies (eg. portosystemic shunts)
- Biliary system evaluation

Contrast Enhancement:

- Arterial phase: Hepatic arteries and hypervascular lesions
- Portal phase: Parenchymal enhancement
- Delayed phase: Washout characteristics of lesions

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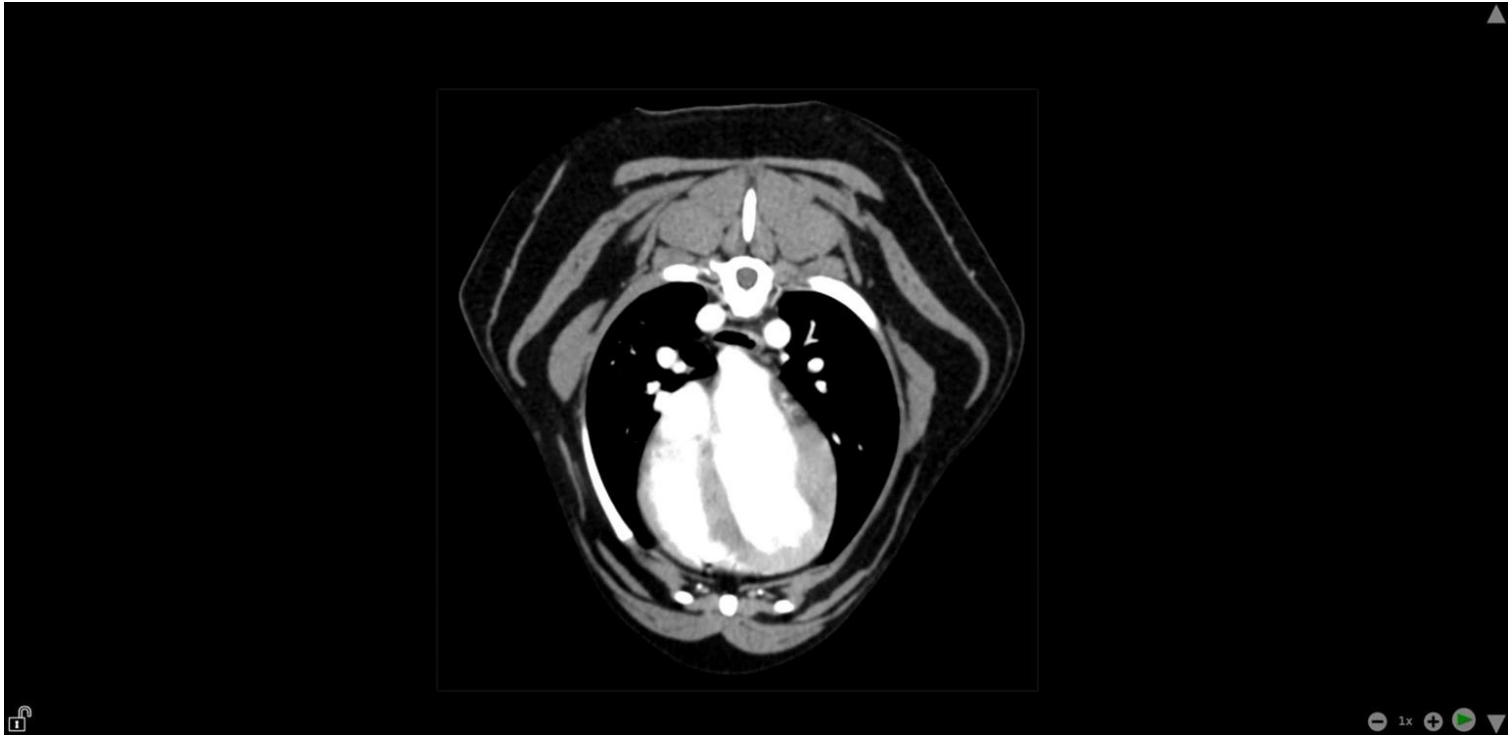
Computed Tomography (CT)



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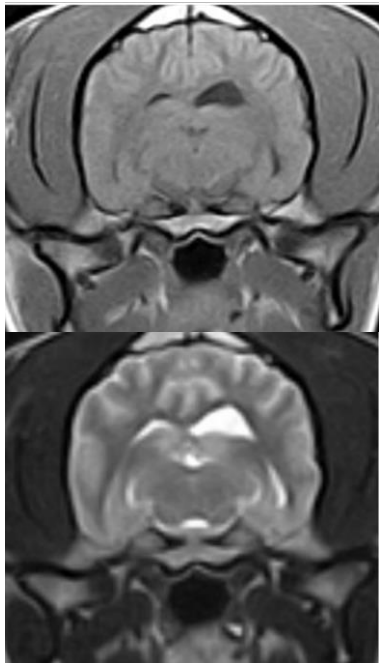
MRI Imaging: Magnetic Resonance

Principle: Uses magnetic fields and radio waves to generate detailed images of organs and tissues

Common Uses: Soft tissue imaging, brain and spinal cord conditions, musculoskeletal system

Strengths: No radiation, high soft tissue contrast, great for neurological imaging

Limitations: Expensive, time-consuming, not ideal for bone fractures



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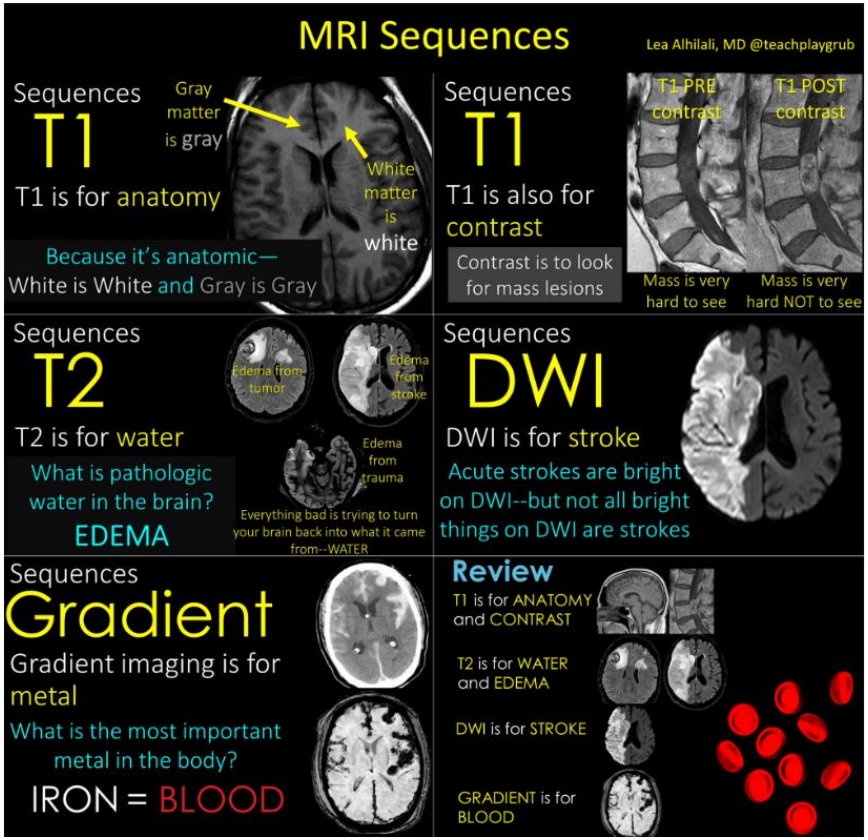
Common MRI Sequences



Magnetic Resonance Imaging (MRI)

Best for:

- Detailed soft tissue contrast
- Detecting subtle liver disease
- Biliary and vascular abnormalities

MR Cholangiopancreatography (MRCP): Non-invasive bile duct evaluation

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MRI: Hepatobiliary

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Conclusion

- Imaging is essential for helping to evaluate hepatobiliary health in dogs and cats, & ZooMed patients
- Combining multiple imaging techniques improves diagnostic accuracy
- Ultrasonography remains the first-line modality, with CT and MRI used for advanced diagnostics
- Multiple imaging modalities may be needed in the workup of a hepatic enzymopathy patient

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QUESTIONS?

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