ULTRASOUND DIAGNOSIS: THE SONOGRAPHIC APPEARANCE OF COMMON DISEASES IN DOGS AND CATS

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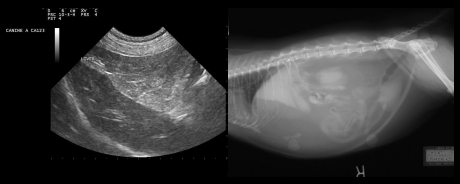
HEPATOBILIARY SYSTEM

NORMAL LIVER ARCHITECTURE

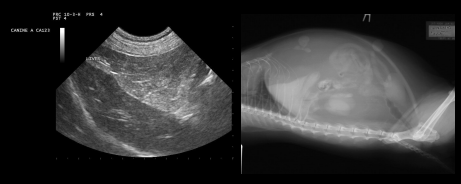
- Medium level, rough, homogeneous, "salt-and-pepper" echogenicity
- S>L>K (SLinKy)
- Prominent, tapering vessels
- Smooth margins

LIVER AND STOMACH

CAT LIVER AND FALCIFORM FAT



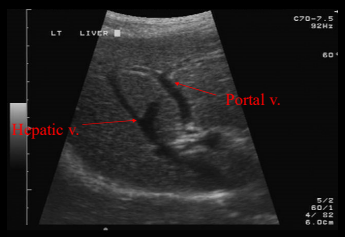
CAT LIVER AND FALCIFORM FAT



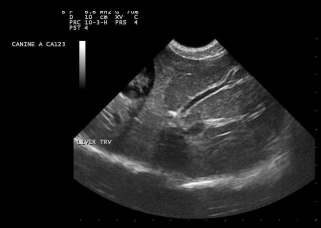
INTRA-HEPATIC VASCULATURE

- Portal veins
  - Nutrient rich, deoxygenated blood from intestines to liver
  - Anechoic tapering tubes with hyperechoic walls
- Hepatic veins
  - Deoxygenated blood from liver to cava to right heart
  - Anechoic tapering tubes with walls you can't see
- Hepatic arteries
  - Oxygenated blood that supplies liver parenchyma
  - Not seen at all

INTRAHEPATIC PORTAL VEIN AND HEPATIC VEIN



WHICH ARE THESE?

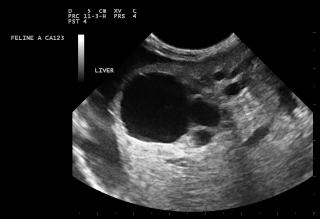


BENIGN HEPATIC PATHOLOGY

- Hepatic lipidosis (fatty liver syndrome)
- Nodular regeneration
- Cirrhosis (end-stage liver)
- Cholangiohepatitis
- Hepatic abscess
- Hepatic cysts
- Benign tumors
- Hematoma
- Hepatocutaneous syndrome

HEPATIC LIPIDOSIS

HEPATIC CYSTS



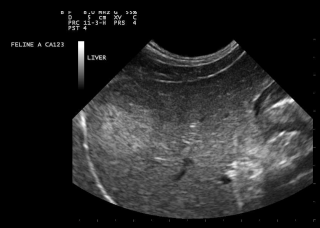
HEPATOCUTANEOUS SYNDROME

HEPATOCUTANEOUS SYNDROME

MALIGNANT HEPATIC DISEASE

- Hepatocellular adenocarcinoma – dogs
- Hemangiosarcoma - dogs
- Cholangiocellular adenocarcinoma - cats
- Lymphosarcoma – cats and dogs
- Metastatic liver disease

BENIGN? MALIGNANT?



NODULAR DISEASE

Benign Characteristics

- Round to oval shape
- Well defined margins
- Non-cavitary
- Homogeneous
- No capsular bulge
- Small size
- A few of them and similar size

Malignant Characteristics

- Irregular shape
- Poorly defined margins
- Cavitary
- Heterogeneous
- Bulge capsular surface
- Larger in size
- Many of them all of various sizes

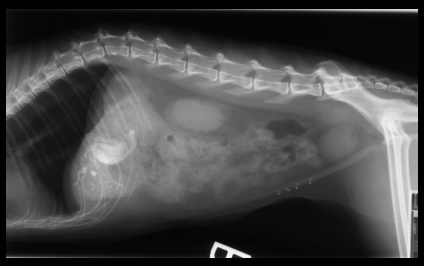
CAVITARY LIVER NEOPLASM ADENOCARCINOMA

CAVITARY LIVER MASS

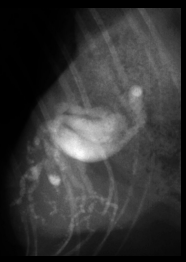
METASTATIC LIVER NEOPLASIA

HEPATIC LYMPHOSARCOMA - CAT

LATERAL ABDOMEN

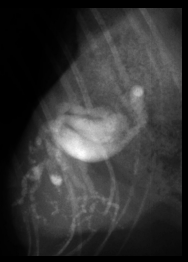


VD AND CLOSE UP LATERAL ABDOMEN

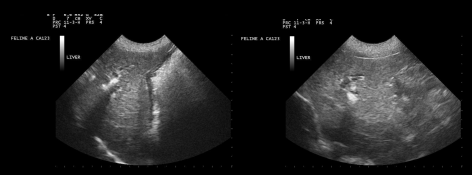


DIAGNOSIS?

- Dystrophic mineralization of intrahepatic vessels due to previous parasite migration
- Cholangiohepatitis
- Cholelithiasis
- Cholelithiasis and choledocolithiasis
- Screen artifact



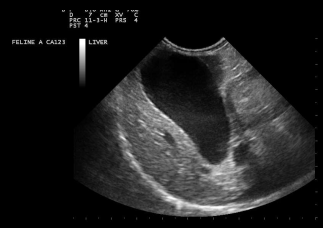
CHOLANGIOHEPATITIS AND CHOLEDOCOLITHS



NORMAL GALL BLADDER

- Round to oval in shape
- Filled with anechoic bile
- Variable size
- Thin, smooth wall
- Located in right lateral liver area
- Don't see normal cystic or bile ducts

DILATED K9 GALLBLADDER



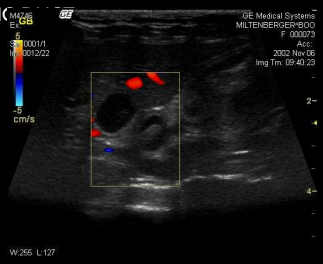
DISEASES OF THE GALL BLADDER

- Cholelithiasis
- "Sludge"
- Biliary obstruction
- Cholecystitis
- Biliary mucocoele
- Gall bladder rupture
- Congenital anomalies
  - Bilobed gall bladder
  - Double gall bladder

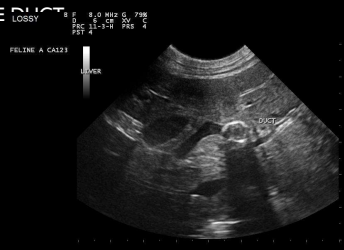
CHOLELITHIASIS

GALL BLADDE

DILATED CYSTI



STONE IN BILE DUCT

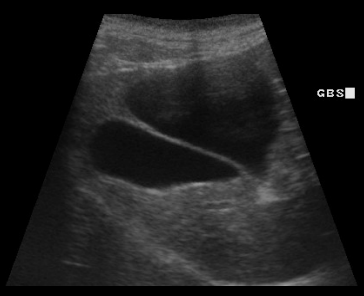


CHOLECYSTITIS

BILIARY MUCOCOELE
"KIWI" VARIETY

BILIARY MUCOCOELE
"HONEYBUN" VARIETY

BI-LOBED G

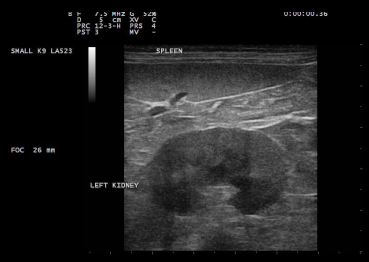


THE SPLEEN

NORMAL SPLEEN

- Moderate, smooth, echogenicity
- Hyperechoic than both the liver or renal cortex (SLinKy)
- Variable size
- Smooth capsule
- May see focal well defined areas of hyperechoic fat near hilus

SPLEEN AND KIDNEY



NORMAL SPLEEN

MYELOLIPOMAS IN SPLEEN

BENIGN SPLENIC DISEASE

- Hemangioma
- Hematoma
- Passive congestion
- Extramedullary hematopoesis
- Torsion/infarction
- Splenitis

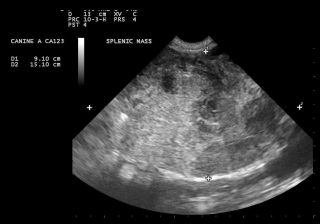
HEMANGIOMA/HEMATOMA

MALIGNANT SPLENIC DISEASE

- Hemangiosarcoma
- Lymphosarcoma
- Mast cell tumor
- Extra-cellular osteosarcoma

POORLY DEFINED SPLENIC MASS

COMPLEX SPLENIC MASS



SPLENIC LYMPH

INGLE

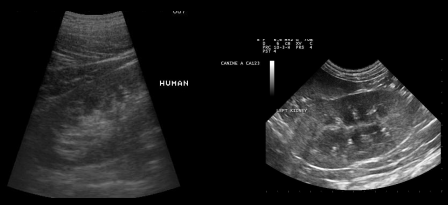
THE KIDNEYS

NORMAL KIDNEYS

- Left easiest to find
- Homogeneous, moderately hypoechoic cortex
- Hypoechoic to anechoic medulla (unlike human kidneys)
- Well defined corticomedullary junction
- Intra-renal details
- Radiographs better for relative size

NORMAL LONG KIDNEY

HUMAN KIDNEY

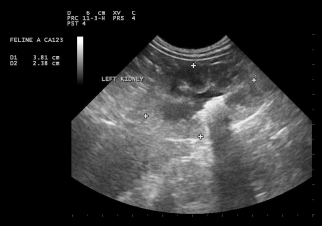


BENIGN RENAL DISEASE

- Calculi
  - pelvic calculi
  - dystrophic mineralization of diverticuli
- Chronic renal disease ("old cat kidneys")
- Obstructive renal disease
- Cortical infarction
- Ethylene glycol toxicity
- Pyelonephritis
- Feline Polycystic Renal disease
- Perinephric pseudocyst

DYSTROPHIC MINERALIZATION OF RENAL DIVERTICULI

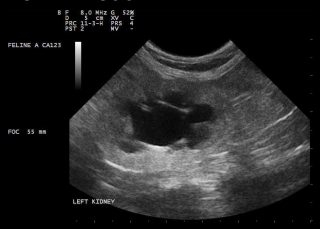
RENOLITH



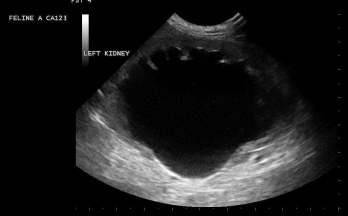
OBSTRUCTIVE RENAL DISEASE

- Ureterolith(s)
- Transitional cell carcinoma in bladder, prostate or urethra
- Severe prostatic disease
- Chronic ureteral stricture

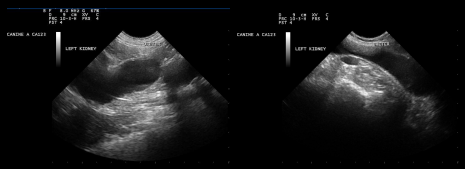
MODERATE HYDRONEPHROSIS



SEVERE HYDRONEPHROSIS



HYDROURETER



POLYCYSTIC RENAL DISEASE

MALIGNANT RENAL DISEASE

- Primary adenocarcinoma
- Metastatic renal disease
- Lymphosarcoma

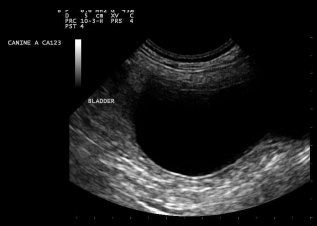
RENAL ADENOCA

THE URINARY BLADDER

NORMAL URINARY BLADDER

- Filled with anechoic urine
- Mucosal margins are smooth
- Wall appearance dependent on degree of distention
  - Minimal – 3 layers, 3-4 mm thick
  - Moderate or greater – 2 layers, 2mm thick
- Ureteral papillae may be present– urine fountains?
- Don't see urethra

BLADDER APEX



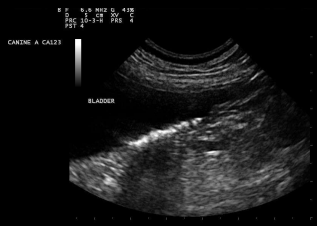
INCOMPLETE DISTENSION

BENIGN BLADDER DISEASE

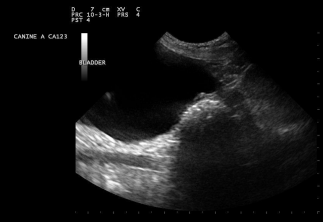
- Calculi
- Sand
- Blood clots
- Cystitis
- Rupture
- Ectopic ureter

BLADDER CALCULUS

CYSTIC CALCULI



COLON PUSHING ON BLADDER



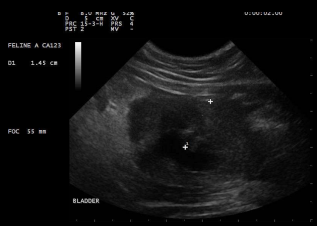
BLOOD OR CLOTS IN BLADDER

- Well defined, irregularly, mixed echogenic mass attached to the bladder wall
- May be free floating
- Normal layering of underlying bladder wall
- May also see floating debris in urine
- Bladder wall may be roughened

MALIGNANT BLADDER DISEASE

- Transitional cell carcinoma
  - caudodorsal bladder wall, irregular in shape, well defined, sessile based, disruption of underlying bladder wall layering, +/- ureteral obstruction
  - can be cranioventral (especially cats)
- Botryoid rhabdomyosarcoma
  - rare, young dogs, "cluster of grapes"

TRANSITIONAL CELL CARCINOMA IN TRIGONE



REPRODUCTIVE SYSTEM

PREGNANCY

- Not good for:
  - counting number of feti
  - predicting whelping (queening) date
- Best for:
  - no radiation exposure
  - more sensitive than radiographs
  - earlier diagnosis of pregnancy
  - fetal viability

PREGNANCY

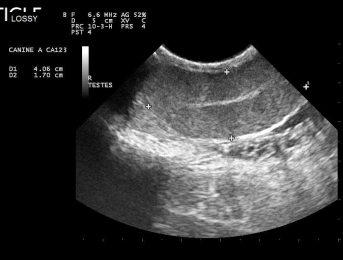
- Earliest reported US diagnosis is 11 days
- Realistic time is 15 days - 5mm, anechoic gestational sacs are seen
- Nearly 100% accurate at 21 days
- Fetal heartbeat seen at 21 days
- Fetal movements seen at 28 days
- Internal organs seen at 30-50 days

VIABLE FETUS

MALE REPRODUCTIVE SYSTEM

- Normal appearance of testicles is very homogeneous, smooth echotexture
- Linear, hyperechoic "rete testis" seen in the middle

NORMAL TESTICLE



TESTICULAR DISEASE

- Orchitis – infection of testicle parenchyma
- Hydrocoele - anechoic fluid around testicle
- Seminoma and interstitial cell tumors appear as mixed echogenic masses within testicle
- Sertoli cell tumor seen as hypoechoic nodules (common in retained testicles)
- Epididymitis seen as increased echogenicity of the epididymus

TESTICULAR NE

TESTICULAR NE

PROSTATE GLAND

- Variable size
- Can hide behind pubis
- Rectal palpation during US may help
- Normally moderately hyperechoic and uniform in texture
- Sensitive for size

NORMAL PROS

PROSTATIC DISEASES

- Benign prostatic hypertrophy
- Prostatitis/abscessation
- Paraprostatic cysts
- Prostatic neoplasia

MILD PROSTATOMEGALY

PROSTATIC ADE

INTRA-ABDOMINAL GLANDS AND LYMPH NODES

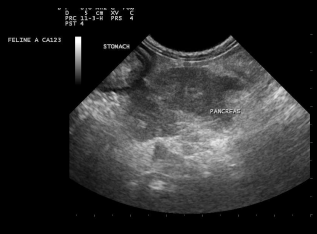
NORMAL PANCREAS

- Can find in 50% of patients
- Right lobe – medial to descending duodenum
- Left lobe – caudal to stomach, cranial to colon

PANCREATITIS

- US is more sensitive than radiographs
- Mild - US is normal
- Moderate to severe - complex, mixed echogenic masses, +/- free peritoneal fluid
- Secondary biliary stasis (distended gall bladder and cystic duct) and paralytic ileus of descending duodenum

PANCREATITIS



ADRENAL GLANDS

- Normal - difficult to find
- Symmetrical in size
- Dogs - adrenal thickness (D to V) is best indicator of normal size, and should be < 4mm (toy breed and cats), < 6mm medium breeds and <9mm giant breeds

ADRENAL ANATOMY REVIEW

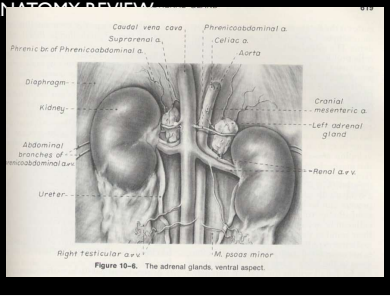
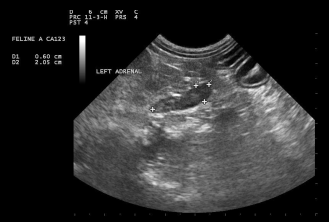
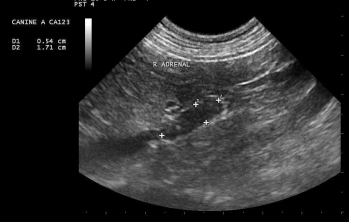


Figure 10–6. The adrenal glands, ventral aspect.

NORMAL LEFT ADRENAL



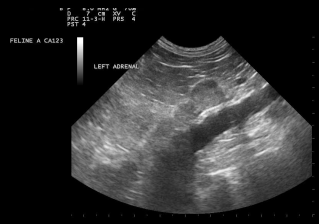
NORMAL RIGHT ADRENAL



PITUITARY DEPENDENT HYPERADRENALCORTICISM

- Both glands may appear normal in size, shape and texture - most common
- Both glands may be symmetrically enlarged
- No evidence of invasion into surrounding tissues
- By far most common form of Cushing's in dogs

PLUMP LEFT ADRENAL



ADRENAL DEPENDENT HYPERADRENALCORTICISM

- Unilateral adrenomegaly
- May push on and compress adjacent vessels, but should not invade
- Contralateral adrenal gland should be atrophied and therefore very hard to find
- Uncommon in dogs

PRIMARY ADRENAL ADENOMA

THE GASTROINTESTINAL TRACT

NORMAL US OF THE BOWEL

- Stomach and small intestinal wall have 5 distinct layers, and differ only in thickness and peristaltic rate:
  - stomach - 3-5mm thick, 5 waves/minute
  - small intestine - 2-3mm thick, 5 waves/minute in duodenum and 3 waves/minute

STOMACH AND LIVER

STOMACH WALL – NON DISTENDED

RUGAL FOLDS

"END-ON" PYLORUS

SMALL BOWEL WITH INGESTA

SMALL BOWEL WITH INGESTA

MALIGNANT GI DISEASE

- Lymphosarcoma
- Adenocarcinoma
- Leiomyoma
- Leiomyosarcoma

MURAL LSA

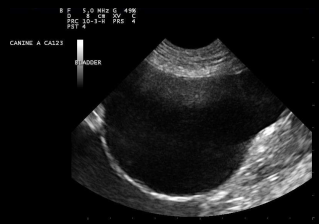
GASTRIC LYMPHOSARCOMA

PERITONEAL SPACE

FREE PERITONEAL FLUID

- More sensitive than radiographs
- Fibrin tags indicate chronicity
- Indicator of type of fluid
  - compare echogenicity to that of urine

BLADDER "GUTTERS"



FLUID AROUND GALL BLADDER