

## Advanced Abdominal Ultrasound Hints

**Focused Exam - Gastrointestinal:** Stomach, Duodenum, Small Bowel, Feline Ileum, Colon

**Probe:** Linear. **Harmonics:** On.

**Depth:** *stomach* – ventral wall  $\frac{1}{2}$ + screen depth; *duodenum*- 4-6 cm; *small bowel* – dorsal body wall  $\frac{3}{4}$  down screen depth.

**Evaluate:** colon only if abnormal; feline ileum only if seen (prominent submucosa)

**Note:** --lumen diameter and measure if >1cm

--variations in wall thickness

--submucosal short axis striping can indicate lymphangiectasia

--obliteration of normal layering means infiltrative disease: phycomycosis, neoplasia, etc.

**Measure:** stomach wall thickness, duodenum mucosa/muscularis/wall thicknesses, small bowel mucosa/muscularis/wall thicknesses

**Count:** motility for 3 minutes in stomach, duodenum and small bowel. Divide by 3 to get peristaltic waves per minute.

### **Normals:**

**Small Bowel Layers:** *white* – lumen; *black* – mucosa; *white* – submucosa; *black* – muscularis; *white* – serosa.

**Motility:** *stomach* 3-6 peristaltic waves per minute; *small bowel* 1-3 peristaltic waves per minute.

**Dog Wall thickness:** *stomach* 3-5mm; *duodenum* 2-6mm; *jejunum* 2-5mm; *colon* 2-4mm.

**Cat Wall thickness:** *stomach* 1-3mm; *pylorus* 2-4mm; *duodenum* 1.5-3.5mm; *jejunum* 1.5-3.5mm; *colon* 1-2.5mm.

**Mucosa:Muscularis Ratio:** >1.6:1.

**Small bowel luminal diameter** <1.5cm.

### **Obstruction Indicators:**

1) segmental fluid distension;

2) non-uniform peristalsis;

3) hyper- & hypo-motility in the same animal;

4) hypermotility without content progression.

**Caveat:** 2&4 can be seen with non-obstructive motility disorders.

**Hints:** use plenty of gel for videos to avoid black acoustic shadow artifacts; do measurements on long axis still images; avoid rugal folds for stomach wall thickness measurements; try standing, sternal or lateral for dorsal stomach wall masses.

### **Landmarks:**

*Stomach* – caudal to liver, cranial to L limb of pancreas and transverse colon.

*Pylorus* near gallbladder and orad to the duodenum; *Body* between pylorus and fundus; *Fundus* near head of spleen & L kidney.

*Duodenum*- medial and parallel to R abdominal wall, ventral to R kidney, lateral to ascending colon.

*Small Bowel* – throughout abdomen.

*Ascending colon*- medial to duodenum and R limb of pancreas;

*Transverse colon*- caudal to stomach and L limb of pancreas;

*Descending colon* – dorsal to bladder, ventral to L kidney.

## **Focused Exam – Pancreas**

**Probe:** Linear. **Harmonics:** usually on.

**Depth:** pancreas in center screen depth.

**Evaluate:** relative echogenicity (should be isoechoic with fat); echotexture (should be more lobular than fat)

**Note:** hyperechoic halo can mean pancreatitis (saponification of fat)

hyper- or hypo-echoic foci

local fluid can indicate pancreatitis

mineralization.

**Measure** thickness if >1cm.

**Normal thickness** <1 cm.

### **Landmarks:**

*Right limb* - dorsal to duodenum, ventral to right kidney, lateral to the ascending colon;

*Body* – medial to pylorus, near common bile duct;

*Left limb* – caudal to the greater curvature of the stomach, cranio-medial to the left kidney, caudo-medial to the head of the spleen, cranial to the transverse colon.

### **Focused Exam – Adrenal Glands**

**Probe:** linear in small dogs and cats; curvilinear in larger dogs. **Harmonics:** off.

**Depth:** aorta and/or cava  $\frac{3}{4}$  down the screen.

**Evaluate:** size, shape, masses, mineralization.

**Measure:** each adrenal length x width at the widest point (usually caudal pole in the dog and middle in the cat).

**Normals:** <4-5mm wide (cat), <7-8mm wide (dog).\

#### **Hints:**

mineralized adrenals in the dog are often neoplastic (benign or malignant), but normal cat adrenals can be mineralized;

bilateral adrenals >7-8mm in the dog – 77% specific, 80-90% sensitive for PDH

if can't find adrenals, try lateral lumbar approach.

Use color Doppler to distinguish from vessels

If you see the medulla, you have likely found it

#### **Landmarks:**

**Left Adrenal:** start at cranial pole of the L kidney and fan medially. When you pass through the aorta, you have missed it, so fan back. The L adrenal gland usually sits just cranial to the L renal artery. L Phrenicoabdominal vein causes the peanut shape.

**Right Adrenal:** start at cranial pole of the R kidney and fan medially to pass through the cava. The R adrenal gland usually sits between the cava and the aorta. When you have passed through the aorta, you have missed it, so fan back.

### **Focused Exam – Iliac Lymph Nodes & Aortic Bifurcation**

**Probe:** Linear. **Harmonics:** On.

**Depth:** aorta at center of screen depth.

#### **Evaluate:**

Doppler flow in terminal aorta and Caudal Vena Cava;

If iliac lymph nodes enlarged, measure the largest;

Look for retroperitoneal fluid.

**Normals:** lymph nodes <5mm in thickness; >1cm thick markedly enlarged; >2-3cm, usually neoplasia.

**Hints:** If can't find lymph nodes, try lateral paralumbar approach; normal lymph nodes are isoechoic to fat.

**Landmarks:** The bifurcation of the aorta is ventral to the neck of the urinary bladder. The medial iliac lymph nodes sit amongst the terminal aortic branches.

### **Focused Exam – Reproductive: Ovaries, Uterus, Pregnancy, Testicles, Prostate**

**Probe:** either linear or curvilinear. **Harmonics:** off for all but early pregnancy.

**Depth:** organ of interest in center of screen depth.

**Evaluate:** presence of ovaries, uterus, testicles, pregnancy.

Size, shape, echotexture of prostate.

**Note** masses, fluid in uterus.

**Normal prostate size:**  $\frac{1}{2}$ - $\frac{2}{3}$  the pelvic inlet (check this on x-rays).

Normal uterus <1cm in width. Post-partum uterus 3-5cm, involuted by 3-4 weeks.

**Hints:** Ovaries >3cm are likely neoplastic.

#### **Pregnancy:**

Gestational age < 40 days:

$$GA = (6 \times GSD) + 20$$

$$GA = (3 \times CRL) + 27.$$

GSD=gest sac diameter;

CRL=crown-rump length.

Fetal intestinal motility indicates imminent birth.

Fetal heart rate >190 – minimal stress;

160-180 – mild distress;

140-160 – moderate distress, risk of death if not delivered in 2-3 hours;

<140 – severe distress, death is imminent without c-section.

#### **Landmarks**

Ovaries sit up to 3 cm caudal to the caudal pole of the ipsilateral kidney, and are hypoechoic to fat

Uterine body found ventral to the neck of the urinary bladder, and each horn runs from there to the ipsilateral kidney.

Cryptorchid testicles can be found anywhere from the inguinal ring, to the caudal pole of the ipsilateral kidney.