

Abdominal Ultrasonography: The Basics

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The goal of this lecture is to provide an overview of basic abdominal ultrasonography and share the author's experiences both as a private practitioner and currently as an academic radiologist. It is beyond the scope of these proceedings and lecture to provide comprehensive instruction in basic ultrasonography. The reader is strongly encouraged to consult the references listed below.

Abdominal ultrasonography has a steep learning curve and is highly operator dependent. Keys to success are training provided by radiologists, a thorough and consistent approach to scanning the abdomen and lots of practice. A solid understanding of your equipment's "knobology", image optimization and limitations is indispensable and the equipment sales team/applications experts can help.

1. Know the anatomy and anatomic relationships of abdominal structures.
2. Scanning positions
 - a. Dorsal recumbency
 - b. Lateral recumbency
 - c. Rarely sternal
3. Data entry
 - a. Patient ID
 - b. Hospital ID
 - c. Operator ID
4. Annotations
 - a. Left vs. Right
 - b. Sagittal vs. Transverse
 - c. Organ identification
5. Image archiving
6. Systematic approach
7. Patient preparation: I prefer using #40 clipper blade and ultrasound gel. I avoid alcohol unless performing aspirates or impromptu imaging of a non-clipped region.

All organs must be scanned in at least 2 planes

1. Sagittal/longitudinal/long axis
2. Transverse/axial/short axis,
3. Dorsal and oblique planes are often used

When imaging a structure in orthogonal planes, attempt to keep it in the center of the monitor. This is essential to confirm that you have imaged the same structure in 2 planes. Practice following vasculature and the intestinal tract will develop eye-hand coordination, improve dexterity and develops confidence.

There are many different methods for scanning the abdomen. This author prefers a systematic, cranial to caudal approach, in the following order:

Liver, gallbladder, stomach, left limb of the pancreas, spleen left kidney, left adrenal gland, left ovary (intact females), left medial iliac lymph node, urinary bladder, prostate gland/uterus/uterine stump, and then move up the right side of the abdomen to image the right side paired organs. Additionally from the right side the duodenum, pylorus, body and right limb of the pancreas is examined. This is followed by a grid approach through the abdomen providing a thorough evaluation of the small-intestine, jejunal and colic lymph nodes and ileocolic junction. All segments of the colon (descending, transverse and ascending) are also traced.

Equally important is assessing peritoneum and retroperitoneal spaces for the presence of fluid and gas, echogenicity (hyperechoic, hyperattenuating), and/or nodular, or lobulated appearance.

A vascular study includes evaluation of the caudal vena cava, aorta, and aortic bifurcation, splenic and hepatic veins, portal veins both intra and extra-hepatic.

Goals for proficiency in basic abdominal US should include the following

Liver, GB, spleen, kidneys, prostate gland or uterus. Ability to recognize the gastrointestinal tract and based on sonographic characteristics and anatomic location you should be able to differentiate colon vs. SI vs. stomach. Be able to confidently identify landmarks for the left and right adrenal glands and medial iliac lymph nodes.

Develop dexterity and comfort following a structure and work towards developing confidence that you have evaluated a structure completely.

Evaluate all organs for size, shape, margin, location and echogenicity.

Relative echogenicity of major abdominal organs (In decreasing order of echogenicity - brightest to darkest)

- Intact male prostate
- Spleen
- Liver
- Renal cortex
- Renal medulla
- Neutered male prostate

References

Atlas of Small Animal Ultrasonography (2008) D. Penninck, MA d'Anjou

Small Animal Diagnostic Ultrasound (2002) TG Nyland, JS Matton

Small Animal Ultrasound (1996) RW Green