

Gastrointestinal ultrasound: fun and faster than radiographs?

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Ultrasound is becoming a widely available tool for diagnostic imaging in all small animal practices. Machines are reasonably inexpensive and training widely available. This session will discuss machine features and scan protocol considerations for abdominal ultrasonography for general small animal practices. The session will conclude with a demonstration.

Introduction

Ultrasound is a highly technical and very economically rewarding form of imaging available to all levels of veterinary practice. This presentation will cover the breadth and depth of veterinary ultrasound and discuss the economical aspects of introducing it into your practice.

Clinical Scenario

Although as vague as “ADR” or anorexia, clinical signs often point directly to an abdominal basis of disease. This can include abdominal pain or distension, icterus, vomiting or specific hepatobiliary, urinary, reproductive or gastrointestinal signs on physical exam, history or blood work. The most important decision may be, “Is this surgical or not?”. More often than not, ultrasound provides the most important aspect of that answer in our clinical setting.

Normal Anatomy

Like any other form of imaging, knowledge the normal appearance of abdominal structures, including anatomical variations, is required for detection of, and differentiation of disease. There are many resources available for this, including anatomy and ultrasound textbooks. Beyond the anatomy, the sonographer must be able to acquire high quality images of the relevant abdominal structures. Errors of omission are most common that other error types, i.e. not finding the organ or lesion is more common than misinterpretation of a particular sonographic appearance.

Surgical Gastrointestinal

Our most common emergency ultrasound procedures are to rule out a suspected gastrointestinal surgical condition. The most common disease are as follows, in order of the ease of diagnosis (not prevalence or need for urgent surgery).

1. Intussusception

The intussusception is a large mass lesion. It is always composed of the internal intussusceptum portion within the outer enveloping intussusciens. Interestingly, in 2nd and 3rd world nations, these are often not surgical, resolving merely with the induction of

general anesthesia. In our caseload, these usually have an underlying cause of abnormal gastrointestinal motility, including other causes of surgical and nonsurgical conditions. The most common site is the ileocolic junction, but possible from the terminal esophagus through the descending colon. The sonographic appearance is classic, therefore relatively straightforward.

2. Foreign body

The mechanical obstruction caused by a foreign body, usually a “lucent” foreign is the most common cause of a emergency surgical abdomen in our practice. Foreign bodies run the gamut from balls, peach pits, corncobs to name just a few. In cats we add trichobezoar (hairballs) Sonographically these can be very easy or very, very challenging. The location often determines the difficulty, with the “high duodenal” foreign body being the most difficult. In any event the sonographic features are consistent.

The sonographic features of an obstructive intestinal foreign body form a triad. This triad is composed of a) fluid distended orad segment, b) empty aborad segment and c) the transition point. At the transition point you must see a space occupying luminal lesion with a hyperechoic near interface which has a shadow artifact. Missing any one of the triad is grounds for doubting your decision to perform surgery. Dogs eat foreign bodies all the time so just seeing one is not enough to perform surgery. Because they eat strange things, dogs commonly develop gastroenteritis with both fluid-filled and empty segment. You must find all three signs of the triad to be confident about the need for surgery.

3. Linear foreign body

Although not the most common foreign body, this is the most important surgical lesion. By failing to recognize a linear foreign body (LFB), the prognosis will greatly suffer as more time progresses for additional workup or empirical therapy. In dogs, approximately 50% will display similar signs as listed above for an obstructive foreign body; the “triad”. However, at least half of all dogs and most cats will not have a distended orad segment. This is very important to factor in to your evaluation. You do not have to see a fluid distended portion of small intestine. Commonly the stomach will be fluid-distended for reasons listed below.

Linear foreign bodies are composed of two segments: head and tail. The fixed “head” portion prevents passage down the intestines. In cats we all know to look under the tongue. This also occurs in dogs. If not under the tongue, the most common site of fixation is at the pylorus. This causes two effects. First, as previously mentioned, it prevents passage of the foreign body and secondly causes a gastric outflow obstruction. A fluid-distended stomach may be the most obvious part of the ultrasound (or radiographic) findings.

The second component of the LFB is the tail, which is the portion dangling downstream from the head. This portion causes plication of the affected segment, usually duodenum and proximal jejunum. The recognition of this plication is essential to the diagnosis of a LFB.

Most cats do quite well with this lesion. But, in my experience, approximately 25% of dogs will succumb to this disease. Time-to-presentation and time-to-diagnosis determines the prognosis. Perforation is common with this disease.

4. Obstructive neoplasia

Many tumors can cause obstructions. In the intestines they may have the form a similar triad as noted for foreign bodies with foreign material accumulating at the tumor site. Patients may have clinical signs (e.g. anorexia, vomiting) merely from growing a cancer as a paraneoplastic effect. Or the tumor may cause obstruction due to impingement upon or growing into the gastrointestinal lumen. An important aspect of an ultrasound in these cases are to assess for mets and verify cytology, especially in dogs. In our practice, surgeons will not take a dog to surgery until a diagnosis of gastrointestinal lymphoma has been excluded. This usually requires an ultrasound-guided fine needle aspiration for a cytological sample.

5. Stricture

Ouch! These are extremely difficult cases because 1/3 of the classic triad is missing. The true stricture has no foreign body nor mass at the transition site. However, the persistence of the transition site provides evidence of a stricture.

...versus a Medical Gastrointestinal cause of vomiting, anorexia or abdominal pain

6. Pancreatitis

Pancreatitis is a very, very common disease and, in dogs, a fairly straight forward ultrasound diagnosis. In cases of canine pancreatitis, the peripancreatic fat because very hyperechoic telling you, as the sonographer, "Hey! Look here! Something's wrong here!". Although quite nonspecific, hyperechoic fat always alerts the sonographer to localized diseased. Next we interrogate the area of the hyperechoic fat to determine the cause. With pancreatitis, the pancreas becomes hypoechoic, enlarged, rounded and painful. Imaging this pancreas may be difficult because the patient does not appreciate you pushing a hard plastic object into their inflamed painful pancreas and tenses their abdomen or tries to move away (Murphy's sign). Dogs most commonly get pancreatitis in the right limb and body regions.

Cats, always refusing to be "little dogs", do not conform to this combination of signs and may not have inflamed peripancreatic fat nor a very enlarged, painful pancreas. Cats get pancreatitis equally prevalent in the left and right limbs.

To evaluate the entire pancreas is extremely difficult. It requires keen knowledge of anatomy and advanced sonographic skills. The pancreas extends from the descending duodenum to the gastric fundus in the dog. In the cats the pancreas extends from the ascending duodenum to the splenic head. This entire area, including the pyloro-duodenal junction for the body region, must be evaluated or a localized region of the pancreatitis can be missed.

Gastroenteritis

1. Infiltrative gastrointestinal disease

Inflammatory bowel disease (IBD) is a very common disease cats. The most common manifestation of IBD in cats is thickened muscularis layer. Often the overall bowel wall thickness is within normal limits. Mild adenopathy accompanies both diseases. Severe adenopathy is more common with lymphoma. Differentiation of IBD and lymphoma is a very controversial subject, beyond the scope of this presentation. Cytology, histology and PARR all have their merits and short comings. PARR (PCR for clonal

antigen receptor gene rearrangement) is thought to be approximately 90% specific and 65% sensitive for feline lymphoma (Colorado State University, Clinical Immunology Laboratory FAQ sheet)

In dogs the only “easily” identifiable form of inflammatory bowel disease is lymphangiectasia. With this disease large chyle filled spaces (lacteals or clumps of lacteals) accumulate in the mucosal layer leading to a protein-losing enteropathy. Often dogs have concurrent peritoneal free fluid. This disease is common in Yorkshire terriers. Sonographically there are linear parallel striations in the mucosal layer of many, if not most, small intestinal loops. Usually there is not concurrent adenopathy. The overall bowel thickness is usually within normal limits.

Conclusions:

Abdominal ultrasound should be a routine component of the workup of many patients with signs of gastrointestinal disease. This is also especially true when a biopsy is required for better characterization through cytology or histology. Surgical gastrointestinal lesions can often be quickly found and differentiated from medical conditions.