Radiography in the Acute Canine Abdomen

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Abdominal radiographs are a rapid, readily available method to give an overview of the abdomen. Though most people believe ultrasound is the new modality of choice for abdominal evaluation, the limitations of ultrasound not being able to penetrate gas as well as the technical ability and time to acquire images still make abdominal radiographs a great first modality in the patient with acute abdominal pain.

Ultimately, the question for the clinician with an abdominal patient is whether surgery is indicated or if medical management is the best course of action. With radiographs providing an overview of the entire abdomen, and the use of the gas within the bowel to provide contrast, abdominal radiographs can be useful as a triage tool that can be augmented and finding further characterized using abdominal ultrasound.

When evaluating the stomach, generally most abdominal radiographs include a right lateral and ventrodorsal projection. The question always arises on why this is performed. These two views have become the standard since a right lateral projection places gas in the fundus of the stomach and fluid in the pyloric antrum. To evaluate the pylorus, a ventrodorsal projection is used to put fluid in the fundus and gas in the pyloric antrum. At Michigan State University, we take 3 view radiographs of all abdomens to include a right lateral to seen the fundus, a left lateral to evaluate the pylorus and look for pyloric outflow obstructions and a ventrodorsal to provide more information about the pylorus and to better evaluate the colon.
With the availability of ultrasound, the use of contrast medium for upper gastrointestinal contrast medium procedures is not routinely performed. However, in clinics without the benefits of ultrasound, barium or iodinated contrast medium procedures still provide some use to evaluate if a luminal obstruction exists, if the bowel wall is think or infiltrated, look at overall motility or assess for a rupture. The main drawback to this procedure is that if any of those differential diagnoses are suspected, an exploratory laparotomy is indicated rather than a contrast procedure that could delay surgery by 3-6 hours.

Barium contrast medium is the most universally used for gastrointestinal imaging. It is safe, the dose is 6-10 milliters per pound and generally is administered through a gastric tube. If aspirated, barium causes physical obstruction of the airways with no inflammatory component, but may cause granulomas if it leaks into the peritoneal or pleural cavity. For this reason, barium is contra-indicated if a ruptured bowel or ruptured esophagus is suspected. Iodinated contrast medium is generally used intravenously but can be administered orally. The main limitation is that it has a bad taste, is hypertonic so it will draw fluid into the bowel and since it is hypertonic, will cause an inflammatory reaction if aspirated into the lungs.

Positional radiography can also be used to evaluate for free gas in the abdomen. Since an air/fluid interface is needed to help to see gas within the peritoneal space, a horizontal beam projection with the dog on its left side and obtaining a ventrodorsal projection will put the gas in the right lateral abdomen near the pyloric antrum. Since the pylorus is small, the gas accumulation will be identified caudal to the diaphragm.
For gastric dilation with volvulus, the main feature is to obtain a right lateral radiograph. No other projection is needed. If the pylorus is seen in the craniodorsal abdomen, a GDV is confirmed. Numerous times people have been fooled by the normal appearance of the ventrodorsal projection and decided the case was just gastric dilation. Nothing else can put the pylorus in the craniodorsal abdomen except for a GDV.

Small intestinal wall thickness is also something frequently evaluated on survey radiographs. This cannot be done. Since soft tissue and fluid are the same opacity, it is impossible to know if the structure observed is a thick wall or just a combination of fluid summating with the small intestinal wall.

The abdomen is divided into two spaces, peritoneal and retroperitoneal. The retroperitoneal space contains the adrenal glands, kidneys and sublumbar lymph nodes and the peritoneal space contains the remaining organs. This determination is important since it will aid in the differential diagnoses of a mass that is present or the cause for gas within the abdomen. The retroperitoneal space is dorsal to the colon. Therefore if a soft tissue mass displaces the colon ventrally, then the mass is likely retroperitoneal indicating it is either arising from the kidney or adrenal glands. If gas is present in the retroperitoneum, this is likely secondary to a pneumomediastinum rather than a rupture of the gastrointestinal tract.

Radiographs are useful to determine if a surgical obstruction or mass is present or at least provides a general overview of the abdomen. Though barium contrast medium can be used, this has largely been replaced with ultrasound or exploratory surgery. By the end of this lecture, the audience will seen numerous examples of radiographs for
surgical and non-surgical lesions and how a better understanding of the limitations and benefits of abdominal radiography.