International Congress of the Italian Association of Companion Animal Veterinarians

27 - 29 May, 2011
Rimini, Italy

Next Congress:

SCIVAC International Congress
Mar. 8-10, 2013 - Pisa, Italy

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INTRODUCTION

Constipation and diarrhea are the most common signs of large intestinal disease. Dietary, infectious and parasitic diseases are the most common causes of large bowel diarrhea in dogs. Survey radiographs are still important for recognizing situations where endoscopy might not be feasible such as with obstipation. Strictures may also prevent passage of the endoscope and contrast radiography may be the only means of diagnosing the extent and nature of disease. Ultrasound has also replaced much of the use of contrast radiography and is complimentary to survey radiography. The colon wall thickness and layering can be assessed in the near field of the transducer.

The regional lymph nodes can also be examined which can be important for determining the extent of some lesions. Cross-sectional imaging of the large intestine can be advantageous especially for the intrapelvic portion. Dogs and cats with fecal incontinence may also benefit from cross-sectional imaging, either CT or MRI in order to examine the spinal cord and cauda equina.

Sonographically, only the wall closest to the transducer can be clearly identified when artifacts due to gas and feces are present. The layers are much thinner than the small intestine and all of approximately equal thickness. Peristalsis is not detectable as in the small intestines. Wall thickness is approximately 2 mm or less in dogs and 1.7mm or less in cats, but will appear thicker or thinner based on the degree of distension. The wall of the empty colon will have a very irregular appearance which can be mistaken for infiltration or thickening.

ULCERS AND PERFORATION AND DIVERTICULUM FORMATION

Colonic and rectal perforation has been described in dogs. It can occur following steroid therapy, dehiscence following colonic surgery, perforating foreign body, neoplasia and trauma. Depending on the site of perforation, either peritonitis or retroperitoneal loss of detail with free air may be observed. If the anus or rectum is involved, lucent striations may be present along the wall. Communication with the retroperitoneal space is possible with focal increased soft tissue opacities caudally. Irregular or linear lucencies may be observed. If the ascending, transverse or descending colon is affected, loss of abdominal detail and free air may be identified radiographically. The perforated colon can potentially develop stricture, a diverticulum or stricture. Colorectal diverticula are rarely reported in dogs. Diverticula are due to tears in the muscular layer of the colon that allow the mucosa and submucosal to protrude through the defect. They can occur secondarily to perineal hernia or due to trauma and straining. Vaginorectal, urethrectal and rectocutaneous fistulas have been described. Both diverticula and fistulas can be diagnosed by endoscopy or positive contrast studies. Fistula can be diagnosed by demonstrating a connection with positive contrast between the colon and the vagina, urethra or skin.

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Megacolon is due to hypomotility and dilation of the colon resulting in constipation and obstipation. Common causes of megacolon include idiopathic, chronic constipation, nutritional or metabolic or mechanical. Idiopathic megacolon occurs more commonly in cats. Neurologic diseases include spinal cord disease (cauda equine syndrome, sacrococcygeal agenesis in Manx cats, dysautonomia and Hirschsprung’s disease). Radiographically, it is difficult to differentiate constipation and obtipation from megacolon. Distension of the colon can be recognized radiographically when its diameter is greater than three times that of the small intestines or greater than the length of L7. The opacity of the contents changes when long-standing obstipation and obstruction are present.

The fecal balls will appear to have a bony or near-bony opacity. Rectal and anal strictures can occur secondarily to trauma, chronic inflammation and neoplasia and cause dilation of the colon. Contrast radiography can nicely show the length of the stricture, even if intrapelvic, an advantage over ultrasound. Ultrasound, however can better demonstrate the perirectal tissues in order to rule out a mass. Demonstration of a mass with lymphadenopathy makes neoplasia a likely diagnosis. Ultrasound can be performed from a perianal approach and guided tissue sampling can be performed.
FOCAL WALL THICKENING

Colorectal neoplasia such as polyps and carcinomas occur and usually lead to focal nodules or masses. Focal masses may also be due to benign polyps or granulomas. Adenocarcinomas generally cause a circumferential and focal thickening of the colon with stricture. Lymphosarcoma can also affect the large intestine and may appear focal or diffuse. Both carcinomas and lymphosarcomas occur in dogs and cats. Adenocarcinoma is the most common in cats with lymphosarcoma second. Leiomyosarcoma can also be found in the large intestine and has been described in the cecum. Depending on their size, masses may be difficult to identify on survey radiographs. Often there is air surrounding the lesion protruding into the lumen making it readily visible. Pneumocolonograms can be used to show soft tissue masses and strictures. If the mass is creating a stricture, the colon is often dilated cranial to it. In either negative or positive contrast studies, the wall of the colon is usually irregular and positive contrast may extend into the lesion when neoplasia is present. Strictures due to non-neoplastic causes or extramural compression generally maintain a smooth mucosal surface against the barium contrast.

Ultrasound is currently the method of choice for diagnosing large intestinal tumors. Survey and contrast radiographs are frequently non-specific whereas ultrasound can show can show the exact location and extent of the mass. Limitations of ultrasound include intrapelvic lesions. Neoplastic masses generally cause disruption of the normal wall layering and the lumen can appear asymmetric and irregular. Mineralization may also be present and appear as multifocal hyperechoic structures with acoustic shadowing. Lymphoma generally has a very hypoechoic appearance of the thickened wall. However, mast cell infiltration and leiomyosarcomas can appear similarly. Both fungal and neoplastic disease can lead to focal masses and the ultrasonographic appearance is too non-specific to distinguish the two. Biopsies for histology are always required for a definitive diagnosis. The sublumbar lymph nodes are often enlarged and can be rounded and hypoechoic when colonic neoplasia is present. However, fungal infection can lead to lymphadenopathy also. Ultrasound-guided fine-needle aspiration with a 25gauge needle can be performed to obtain a cytologic diagnosis of intestinal masses.

DIFFUSE THICKENING

Neoplastic, inflammatory and infectious diseases can cause diffuse colon wall thickening. Inflammatory bowel disease (IBD), lymphosarcoma, pythiosis and histoplasmosis can lead to similar radiographic changes. However, wall thickening is typically not identified on survey radiographs. In patients with colitis the colon may or may not be distended. The fluid-filled colon will appear homogeneously soft tissue opaque, possibly with some gas bubbles. Other findings include a generalized gas-filled lumen. Occasionally emphysematous changes of the wall can be identified in patients with gas producing bacterial infections. Radiographically this appears as a lucent border at the serosal surface of the colon wall.

Positive contrast examination in patients with severe colitis may show multifocal extension of the barium into the mucosa which can also be seen with diffuse neoplasia. In ulcerative colitis, an irregular mucosal-barium interface with extension of barium into the thickened colon wall can be observed. Because of the non-specific nature of this finding, histology is always required to make a definitive diagnosis. In chronic inflammatory disease, the colon length may actually become shortened. The colon may also have a corrugated appearance due to spasticity which does not resolve on repeat radiographs. This appearance can occur simply due to the administration of barium.

Sonographically, the colon can be evaluated for wall thickening and loss of layering as well as regional lymphadenopathy, an advantage over survey radiography. Diffuse inflammatory bowel disease (IBD) with lymphocytic plasmacytic infiltration cannot always be detected sonographically. In IBD the wall layering is often preserved and normal to mild wall thickening may occur. Severe diffuse thickening of the colon wall may occur in ulcerative colitis, fungal infections and diffuse neoplastic processes such as lymphoma. The wall can be more than 8mm thick in cats with colonic adenocarcinomas.

REFERENCES


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