

Basic Endoscopy

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Endoscopy is a highly useful diagnostic modality that allows for both the acquisition of diagnostic samples that may provide critical insight into the case management and potential application of interventional therapies. General indications for endoscopy are listed below (not meant to be a complete list)

Indications for upper endoscopy	
Chronic History	Acute History
Chronic vomiting	Interventional therapy
Nausea	Placement of feeding tube
Hematemesis	Removal of foreign body
Chronic diarrhea	Ballooning of stricture
Weight loss suspected to be GI related	Evaluation of a lesion on imaging
Polyphagia suspected to represent malabsorption	Hematemesis
Inappetance suspected to be GI related	Non-responsive gastroenteritis???
Increased stool volume	
Hypoproteinemia	
Hypocobalaminemia, Hypofolateemia	
Increased alpha 1 protease inhibitor	
Suspected gastrointestinal blood loss	
Regurgitation	
Interventional therapy (see acute)	

Endoscopy will never replace a good physical examination, dietary history and appropriate therapeutic trials. Additionally, information obtained from diagnostic investigations may be misleading without appropriate pre-endoscopic preparation.

The need to perform investigational endoscopy for diagnostic samples will be dependent on the chronicity, breed predispositions toward disease, imaging abnormalities and presence of “urgency markers”.

Urgency markers
Rapid weight loss
Severe clinical signs (unrelenting diarrhea, vomiting)
Hypoproteinemia
Hypocobalaminemia, Hypofolateemia
Inappetance

If the patient is stable, then dietary interventions, trial therapies, non-invasive diagnostics should be considered prior to endoscopic evaluation.

Endoscopy can provide be very useful in acute settings when image abnormalities suggest foreign material, accessible lesions and/or response to therapy is atypical/prolonged. However, it should be noted that histopathological assessment in the face of acute, self-resolving, non-specific gastroenteritis can sometimes provide misleading information (ie. inflammation) that may result in unnecessary chronic therapeutic interventions.

Indications for lower endoscopy	
Colonic evaluation	Ileal Evaluation
Chronic large bowel diarrhea (hematochezia, tenesmus, mucus)	Weight loss suspected to be GI related
Obstipation/Constipation	Polyphagia suspected to represent malabsorption
Tenesmus w/o diarrhea	Hypocobalaminemia
Hematochezia w/o diarrhea	Increased alpha 1 protease inhibitor
	Hypoproteinemia
	Chronic vomiting
	Chronic diarrhea

Basic equipment

In general, human endoscopic equipment tends to provide scope lengths that are adequate for small patients (cats, small dogs, medium dogs??) but will not provide good evaluation of the small intestine in larger patients. Additionally, human endoscopes provide variable outer diameters that may be inappropriate for some of our smaller patients (ie. difficulty passing the pyloric region). Variation in internal biopsy channel diameter is present between endoscopes which affects the size of the biopsy forceps that can be passed. Veterinary scopes are available that can provide a longer length and smaller external diameter that may provide the best single investment and potential application to a widest array of patients. The goal is provide the longest length, biggest biopsy channel with a tolerable external diameter.

Basic principles of endoscopy

- Less is more: the less you move the directional controls the better
- You have a body, not just hands: manipulate the scope by angling body clockwise/counter clockwise
- Your hands have wrists: a simple twist of a wrist will torque the scope
- Use your legs: stabilization of scope position can be obtained with leg
- Movement of your scope to up (above the table) and down (parallel to the table) can alter your ability to advance or move

Patient preparation

Esophagoscopy/Gastroduodenoscopy

Prior to the procedure

The patient should be fasted for a minimum of 12 hours prior to the procedure. In patients, that delayed gastric emptying is suspected, these pets should be withheld from food for a minimum of 24 hours. Endoscopy should not be performed after barium studies to prevent scope damage.

During the procedure

- Left lateral placement (unless placing a PEG tube)
- Mouth gag placement to eliminate scope damage

Colonoscopy

Prior to the procedure

The patient should be fasted for a minimum of 48 hours prior to the procedure.

Cats and Small dogs

Enema during the procedure is usually adequate (see below)

Larger dogs

- Admitted to the hospital 12 hours prior to procedure
- Large volume enema provided on admission
- Administration of *Go-Lytely* 30ml/kg via stomach tube on admission
- 20 ml/kg enemas provided q 6 hours over night
- Enema provided morning of the procedure
- Administration of *Go-Lytely* 30ml/kg via stomach tube the morning of the procedure

During the procedure

Left lateral placement

Intra-Operative Enema
Place in right lateral Place distal end of patient at end of table Place absorbent or garbage below patient Attach large red rubber catheter to warmed liter bag of fluids Place red rubber catheter With aid of pressure bag flush into the colon Have the assistant apply intermittent abdominal pressure Roughly at the level of the ileocolic region Using digital manipulation at the anus allow for a space between the catheter and the sphincter

Esophagoscopy

Advancement of the scope through the mouth may require slight traction on the tongue. During entrance into the esophagus, evaluate the proximal esophageal sphincter. As you pass through the esophagus, center your scope and advance. Centering your scope can be performed by slight traction on the insertion tube, body positioning or deflection of the controls (left/right, less commonly up/down). Insufflation of the esophagus will be necessary to evaluate the mucosa and provide good visualization. Insufflation may require pressure at the proximal esophagus to prevent air leakage. The cervical esophagus to the thoracic inlet can have tracheal indentations. As you reach the base of the heart you will note the great vessels/aortic arch that can be pulsatile in this region. The distal esophagus will appear to have a “herring bone” pattern with circular striations in the cat but not the dog. Additionally, superficial vessels will be observed in the cat but not the dog. The gastroesophageal sphincter will be noted at the junction of the stomach and esophagus, the mucosa at this region will be variably redder than the remaining esophageal mucosa. Pigmentation can be noted in the esophagus and can be normal (common in Sharpei dogs). On entrance into the GES, angle your scope towards the center of the sphincter and apply gentle pressure.

Noteworthy features	
Mucosal color	Normally pale to pink (dogs are paler)
Mucosal texture (irregularity, raised nature)	Generally smooth, glistening
Presence of erosions or ulcerations	
Changes in luminal diameter	Absent
Presence of mucus	Absent; natural narrowing is at the thoracic inlet
Presence of foreign material	Can be normal; maybe excessive in some animals
Presence of GERD	Absent
GES patency	Generally absent, can be normal under anesthesia
	Generally closed, but can be open

Gastrosocopy

Gastrosocopy requires a systematic approach to ensure that we have evaluated all aspects of the stomach. Upon entrance into the stomach you will see a “red out” when you contact the gastric mucosa. When this is observed, slightly retract the scope and insufflate until the rugal folds are flattened and/or the stomach is distended. I generally enter the stomach and perform retroflexion to evaluate the cardia. This can be accomplished by entering the stomach straight, insufflating and then counterclockwise rotating the up/down deflection maximally. After doing this, advance the insertion tube away from you. After evaluating this region, release the directional rotation and back the scope out (this will straighten the scope). Then evaluate the gastric fundus and body ensuring that all surfaces are scrutinized. As you approach the pyloric antral region you will note the insicura of the stomach (the boundary between the fundus and the antrum). To advance the scope into the antrum, provide forward pressure on the insertion tube with the tip of the scope angled slightly upwards. This will allow the scope to be deflected into the antrum rather than directly into the wall. Occasionally, the scope will feel like it wants to move backwards when you push the insertion tube forwards. This is when the scope is curling around the greater curvature and pushing forwards results in receptive relaxation of the curvature, moving the scope away from the antrum. This can be helped with slight deflation of the stomach and continued gentle forward pressure. When entering the pyloric antrum, you will note the pylorus in the distance. Variations in appearance will be observed with some patients having folds of tissue overlying the pyloric opening. When attempting to pass through the pylorus, center the scope until we visualize the center of the lumen (“the black hole”). When the lumen is visualized, push forward with gentle but firm pressure. Slight movement of the scope downward and the right will aid in passage in some cases. Additionally, during passage, gentle insufflation can be helpful. Following introduction of the scope a change in the mucosal texture will be observed and you will be blinded by red tissue. Slight retraction of scope and redirection of the directional knobs will help to center the duodenal lumen.

Noteworthy features	
Mucosal color Mucosal texture (irregularity, raised nature) Rugal fold prominence Rugal fold presence Presence of erosions or ulcerations Presence of ingesta Presence of foreign material	Normally pale to pink Generally smooth, glistening Must be interpreted following insufflation Rugal folds are generally not observed in pyloric antral region Absent; can be subtle or healing (whitish, depressions) May represent delayed gastric emptying Absent

Getting through the pylorus
Technique Center the scope until we visualize the center of the lumen (“the black hole”) Push forward with gentle but firm pressure Angle body and insertion tube to facilitate maintaining centralization Slightly insufflate as the lumen is observed Slight movement of the scope downward and the right will aid in passage in some cases. When duodenal mucosal color/texture change noted (red out) slightly retract scope Redirect knobs to center the duodenal lumen Additional Tips Passing a guide wire can aid in passage when difficulty exists Partially decompress the stomach Save your deflection, use your body, make counter movements with advancements Use of larger scope in larger patients may help Use of smaller scopes may be necessary in smaller patients

Duodenoscopy

When the scope is advanced it should move without resistance. Maintaining centralization of the lumen is necessary. As you advance, the major duodenal (medial wall) a may be observed in cats and dogs with the minor duodenal papilla (dorsal wall) being noted in dogs only. Central depressions in the wall are observed cooresponding with the Peyer’s patches in dogs and less commonly in cats. The first duodenal turn noted is the distal duodenal flexure. When you navigate around this bend, gentle forward pressure with counter clockwise rotation of the insertion tube and fine tuning of the directional controls aid in forward movement. Continued pressure on the insertion tube will help with advancement of the remaining working length of the endoscope. Periodically dropping your hands to the table height will aid in complete advancement.

Noteworthy features	
Mucosal color Mucosal granularity (surface texture, cobblestoning) Mucosal friability Presence of erosions or ulcerations Lacteal dilation	Normally pink to red (dogs) Pale/cream to pink (cats) Normal velvety appearance (from villi), less smooth, glistening than stomach (granularity less obvious with insufflation) Contact with scope generally does not result in bleeding Tissue does not shred easily with biopsy Absent; can be subtle or healing (whitish, depressions) Absent Absent

Getting the most from your biopsies	
Blind biopsies	• Advanced when the pylorus can't be intubated (usually ends up at the distal duodenal flexure) • Can be advanced further into the small intestine blindly when scope is maximally inserted (likely will biopsy jejunal tissue) • Instrument is passed till resistance met, then backed up, opened and jiggled → then advanced further till resistance met • Perpendicular technique • Preload biopsy instrument, just beneath the surface • Turn into the wall • Advance biopsy instrument and open • Back up slightly → Jiggle the instrument to open cup • Advance forward into wall • Suction and biopsy • Rip and Pull • Angle slightly to biopsy lateral wall • Advance instrument while open into wall (loosely) • Provide suction to flatten and allow for tissue acquisition • Slightly advance forward • Gently pull out biopsy • Rip and Push • Angle slightly to biopsy lateral wall • Advance instrument while open into wall (loosely) • Provide suction to flatten and allow for tissue acquisition • Slightly advance forward • Push forward away from the scope to tear tissue • Then gently pull out the biopsy
Trouble shooting biopsy	• Make sure using biggest biopsy forceps possible • Spiked biopsy forceps may aid in getting biopsies without slipping • Make sure that the biopsy cup sides oppose one another without gaps (use new equipment if needed) • Learn to biopsy by yourself as this results in maximal precision
Biopsy basics	• Generally acquire 8 good quality biopsies from each site • Place samples on cassette and place in formalin immediately • Minimize iatrogenic biopsy trauma when removing biopsy

Colonoscopy

A good colonoscopy requires good patient preparation. Incomplete studies are common when corners are cut and procedural times are increased from decreased preparation. Standardization of bowel preparation have not been established in veterinary medicine. The above method is the method that I use to facilitate bowel preparation, however, it should be noted that other methods are utilized by other clinicians with different levels of success. On entrance into the anal sphincter you will frequently note a slightly dilated region distally prior to entering the descending colon, this is normal. When you enter the descending colon, a straight lumen will be observed until the left colic flexure. As you approach the flexure, you will need to angle your scope (generally accomplished by rotating your body or insertion tube) so that the tip of the endoscope is angled towards the more proximal transverse colon. Additionally, a slight counter clockwise rotated upward deflection may be necessary to “bank off” the wall and facilitate aboral passage of the scope. The transverse colon is a short segment grossly similar to the descending colon that terminates in the right colic flexure. The colic flexures may or may not be distinctly obvious on passage of the endoscope. As you approach the right colic flexure, similar rotation of the insertion tube (via body positioning and torque on the tube) will be needed for angling the tip aborally. Finally, slight deflection will likely be needed to “bank off” the wall for further movement. In the cat, the ascending colon is short and terminates quickly in the ileocolic region. In the dog, the ascending colon is located farther away from the flexure. The ileocolic sphincter is noted on the lateral wall of the colon and is noted as circular partially raised to more overtly puckered appearing structure. The cecum is noted just adjacent in the dog and can appear to have its own “sphincter” in this region. The cecum is located slightly more perpendicular to the lumen in dogs. As you enter this sphincter, the cecum is a blind pouch that generally has mild residual fecal material. The feline cecum is less distinct and may appear as a continuation of the ascending colon (straight but blind ended).

Noteworthy features	
Mucosal color (hyperemia)	Pale pink to pinkish red
Mucosal granularity, irregularity	Generally smooth, glistening
Mucosal friability	Contact with scope generally does not result in bleeding
Loss of submucosal blood vessels (implies thickening)	Generally submucosal vessels visualized
Presence of erosion or ulceration	Absent

Ileoscopy

Endoscopic evaluation of the ileum can be performed in most medium to large dogs and in many small dogs and cats. Intubation of the ileum directly is difficult in most patients. Insertion of the biopsy instrument through the ileocolic sphincter will act as a guide wire to introduce the endoscope into the ileum in many patients. After the “guide wire” is introduced, it is advanced until resistance is met, prior to insertion of the endoscope. As the endoscope is advanced, gentle twisting may facilitate its movement. When introduced into the ileum the endoscope is centered by moving the directional controls, body positioning and manipulation of scope height. The appearance of the ileum is similar to more proximal small intestine.

Complimentary testing

Tissue cytology (impressions, squash prep): visualization for helicobacter, presence of neoplastic cells
Urease slant testing: colorimetric testing for urease production within 12-24 hours
Testing on biopsy samples (antibiotic testing, FISH, IHC)