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6. Catriona MacPhail THE ABDOMINAL EXPLORATORY: SURGERY AS A DIAGNOSTIC TOOL

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Surgical exploration of the abdominal cavity can be a valuable diagnostic tool, particularly when imaging is equivocal in helping discover what is wrong with an animal. Gastrointestinal obstruction is one such clinical example, where surgery can rule-in or rule-out obstruction when less invasive methods are unrewarding. Abdominal exploratory and subsequent organ biopsies are also used to assist in diagnosis of chronic disease and to differentiate between benign and malignant processes. Stomach and proximal intestinal biopsies are commonly performed using endoscopy. However, biopsies are limited to the mucosal surface and are often only representative of those areas. Abdominal surgery allows for complete exploratory and examination of the entire length of the gastrointestinal tract. Full-thickness samples can be retrieved from the duodenum, jejunum, and ileum to diagnose diseases such as inflammatory bowel disease, lymphangiectasia, and lymphoma. Routine sampling of the liver and lymph node should be considered when in the abdomen for removal of a possible malignant process (e.g., splenic mass, focal intestinal mass).

What should the length of an abdominal incision be for complete abdominal exploratory?

What should be done with the falciform fat?

What is the value of a surgical safety checklist?

Similar to a physical examination, a routine for abdominal exploration should be developed such that nothing will be overlooked. An exploratory can be performed by system or by quadrant; one approach is “cranial-right-left-caudal”:

- Starting cranially, the diaphragm is observed and then the liver is evaluated. Each lobe of the liver can be gently manipulated such that all surfaces are examined. From left to right, the lobes of the liver are left lateral, left medial, quadrate, right medial, right lateral, and caudate. The gallbladder sits between the quadrate and right medial lobes and can be gently palpated; some prefer to express the gallbladder to ensure patency of the common bile duct, but this is often unnecessary if hepatobiliary disease is not suspected. The stomach is then examined and palpated, starting at the terminal esophagus to the fundus, body, pyloric antrum, and pylorus.
- Heading to the right side of the abdomen, the descending duodenum can be lifted gently out of the abdomen to examine the structures within the mesoduodenum (right limb of the pancreas, common bile duct, and portal vein), and then the mesoduodenum



is used to hold back the small intestine to examine the right kidney, caudate lobe of the liver, and the caudal vena cava, often referred to the right gutter. A normal right adrenal gland is not readily visible as it sits under the liver alongside the caudal vena cava. It is difficult to continue to follow the small intestine oral to aboral as the duodenum is tethered at the duodenal flexure by the duodenal-colic ligament.

- Heading to the left side of the abdomen, the spleen is gently examined and palpated from the tail to the head, which is tethered to the greater curvature of the stomach by the short gastric vessels. The descending colon is then lifted to allow the mesocolon to hold back the small intestine and the left kidney and left adrenal gland can be examined (left gutter). The left adrenal gland is identified by the phrenicoabdominal vein coursing back to the caudal vena cava, bisecting the gland into cranial and caudal poles. The gastrointestinal tract is then evaluated from aboral to oral, from the colon to cecum and to the ileum, which is identified by the antimesenteric vessel. Continuing orally, the jejunum is palpated back to the duodenal flexure, taking note of the mesenteric lymph nodes. To examine the left limb of the pancreas, a hole is made in the superficial leaf of the omentum to enter the omental bursa and find the pancreas just dorsal to the greater curvature of the stomach.

- Caudally, the urinary bladder and distal ureters examined. In male dogs, the prostate is palpated by passing a finger dorsal to the urethra. In intact female dogs, the entire reproductive tract is examined from the ovaries to the cervix. In spayed female dogs, the uterine stump can be found dorsal to the bladder on the ventral surface of the distal colon. Medial iliac lymph nodes are found at the bifurcation of the aorta.

VISCERAL ORGAN BIOPSY

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LIVER BIOPSY

There are multiple methods for sampling the liver. If there is a distinct lesion that needs to be sampled, its size and location often dictate the biopsy method. For diffuse disease or routine sampling, the liver can be biopsied along the edge or margin. Marginal biopsies can be performed using a guillotine method, multiple mattress sutures, or stapling equipment. Lesions away from the edge can be sampled using Baker skin biopsy punch or Tru-cut biopsy instrument. Hemorrhage can be controlled using digital pressure, electrocoagulation, or hemostatic agents such as Gelfoam[®] or Surgicel[®].

Guillotine Biopsy Technique:

- Isolate an accessible liver lobe and determine an area that can be easily sample from the hepatic margin.



- Take a long strand of multifilament absorbable suture (e.g., 3-0 Polysorb[®]) and make a loop with a single-throw in place.
- Pass the loop around the tip of the isolated liver lobe and pull the suture snug to allow it to cut through the hepatic parenchyma.
- Small vessels and bile ducts will be bundled in the ligature. Make an additional three throws in the suture, securing the knot.
- Use Metzenbaum scissors to transect the hepatic tissue just distal to the ligature. Take care not to cut the suture.
- Impression smears, aerobic and anaerobic culture, metal testing, and histopathology can all be performed from liver biopsy.
- Observe the cut surface for hemorrhage.

Laparoscopic liver biopsy can be performed through a single port or, more commonly, a two-cannula approach with the animal in dorsal or left lateral recumbency. A 5 mm oval cup biopsy forceps is inserted through the instrument portal. The forceps are pushed into the edge of a liver lobe. The jaws are closed, and the sample held in place for 10-30 seconds before pulling it off the lobe. The site is observed for excessive hemorrhage.

LYMPH NODE BIOPSY

During abdominal exploratory, lymph nodes can be found around the pylorus and right limb of the pancreas, at the mesenteric root, along the descending colon, and at the aortic bifurcation (medial iliac lymph nodes). Lymph nodes can be sampled by fine-needle aspiration, wedge biopsy, or complete excision. The decision on method of sampling is based on involvement of surrounding structures and vascular supply to abdominal organs. Impression smears can be made from biopsy samples for immediate cytological examination to assist in ruling in or out lymphoma.

PANCREATIC BIOPSY

Due to risk of causing pancreatitis, veterinarians often avoid handling much less sampling, the pancreas. However, pancreatic biopsy is indicated to diagnose pancreatitis in cats, or differentiate benign versus neoplastic disease in dogs. If diffuse disease is present, the pancreas is best sampled from the left lobe to avoid damage to pancreatic ducts, the common bile duct, and the pancreaticoduodenal blood supply.

Technique:

- The left lobe of the pancreas is best visualized by opening the omental bursa.
- Gently isolate the caudal tip of the pancreas. Separate it from surrounding mesentery using sharp and blunt dissection.
- Make a loop of suture (as described for liver biopsy), pass it around a small section of pancreas, and cinch the suture snugly to allow it to crush through the pancreatic parenchyma.



- Use Metzenbaum scissors to obtain the sample of pancreatic tissue.

GASTRIC BIOPSY

Biopsies of the stomach are most commonly obtained through endoscopy. However, sampling by this method only retrieves pieces of the gastric mucosa. Surgical sampling retrieves full-thickness sections that may be beneficial in diagnosing schirrous gastric neoplasia that typically infiltrates deeper layers. Routine surgical biopsy is performed either in the ventral aspect of the body of the stomach between the lesser and greater curvature or in the left lateral aspect of the stomach if a gastrostomy tube is going to be placed.

Technique:

- Isolate the stomach from the rest of the abdominal cavity using moistened laparotomy sponges.
- Place stay sutures at each end of the proposed gastric biopsy location.
- Make a full-thickness stab incision into the lumen of the stomach using a #15 scalpel blade.
- Extend the stab incision 1 to 2 cm using the scalpel blade or Metzenbaum scissors.
- Take a biopsy sample from one edge of the incision using Metzenbaum scissors. Make sure all layers of the stomach are sampled.
- Close the biopsy site using a single layer, full-thickness, simple continuous pattern with 3-0 monofilament absorbable suture (e.g., Biosyn, Monocryl).

SMALL INTESTINAL BIOPSY

Like the stomach, intestinal biopsies are commonly performed using endoscopy. However, biopsies are limited to the mucosal surface of the duodenum. Segmental disease or abnormalities in the deeper layers of the intestine may be missed with this method, which is of particular concern in cats as the jejunum and ileum are thought to be the most common locations for gastrointestinal lymphoma. Full-thickness samples can be retrieved from the entire length of the small intestine. The large intestine is rarely surgically biopsied due to the poor healing characteristics of the colon and the risk of peritoneal contamination. A recent study examined complications associated with full-thickness biopsies of the small intestine. Twelve percent of dogs died or were euthanized postoperatively due to biopsy site breakdown. Unfortunately, no predictors for risk of dehiscence were identified.

The most conventional method to biopsy the intestine is to make 2, 1 cm, parallel, longitudinal, full-thickness incisions in the antimesenteric aspect of the bowel using a scalpel blade. An alternative to this technique is to use a 4 to 6 mm Baker's biopsy punch to take a full-thickness sample from the antimesenteric border.



Standard Technique:

- A segment of small intestine is isolated from the rest of the abdominal cavity using moistened laparotomy sponges.
- An assistant's fingers, Doyen intestinal forceps, Penrose drains, or umbilical tape are used to hold back ingesta.
- Make a full-thickness stab incision into the lumen of the intestine on the antimesenteric border using a #11 or #15 scalpel blade.
- Extend the stab incision 1 to 2 cm using a scalpel blade or Metzenbaum scissors. Make sure all layers of the intestine are sampled.
- Close the biopsy site using a single-layer, full-thickness, simple continuous pattern with 3-0 or 4-0 monofilament absorbable suture (e.g., Biosyn□, Monocryl□, PDS□).
- Consider augmenting the enterotomy site with omentum or a serosal patch if the animal is debilitated or hypoalbuminemic.

KIDNEY BIOPSY

The kidney can be sampled percutaneously with ultrasound guidance, through a keyhole flank incision, or through laparoscopy or laparotomy. The two most common methods for sampling the kidney include needle biopsy or wedge biopsy. If exploratory laparotomy is performed, a wedge biopsy of the kidney allows a larger, more representative sample to be acquired. Hemorrhage can be controlled using digital pressure or hemostatic agents. A recent study found that wedge kidney biopsies were more likely to be of good quality compared to needle biopsies. The most common indication for renal biopsy was proteinuria while the most common complication was severe hemorrhage that occurred in approximately 10% of dogs and 17% of cats.

Technique:

- If disease is thought to be generalized, locate, and isolate the left kidney from a standard midline abdominal approach as the left kidney is more accessible due to its relative caudal location.
- Using a #15 or #11 scalpel blade, make a 1 cm wedge incision into the renal parenchyma along the dorsolateral surface.
- Place a small piece of moistened Gelfoam□ into the defect to control hemorrhage.
- Place a horizontal mattress suture (3-0 or 4-0 monofilament absorbable suture) through the renal capsule on either side of the wedge incision to close the defect.
- Confirm that hemorrhage has ceased before closing the abdominal cavity.

REFERNECES



1. Evans SE, Bonczynski JJ, Broussard JD, et al. Comparison of endoscopic and full-thickness biopsy specimens for diagnosis of inflammatory bowel disease and alimentary tract lymphoma in cats. *J Am Vet Med Assoc* 2006;229(9):1447-50
2. Petre SL, McClaran JK, Bergman PJ, et al. Safety and efficacy of laparoscopic hepatic biopsy in dogs: 80 cases (2004-2009). *J Am Vet Med Assoc* 2012;240(2):181-5
3. Radhakrishnan A, Mayhew PD. Laparoscopic splenic biopsy in dogs and cats: 15 cases (2006-2008) *J Am Anim Hosp Assoc*. 2013;49:41-5
4. Rothuizen J, Twedt DC. Liver biopsy techniques. *Vet Clin North Am Small Anim Pract* 2009;39(3):469-80
5. Scott KD, Zoran DL, Mansell J, et al. Utility of endoscopic biopsies of the duodenum and ileum for diagnosis of inflammatory bowel disease and small cell lymphoma in cats. *J Vet Intern Med* 2011;25(6):1253-7
6. Shales CJ, Warren J, Anderson DM, et al. Complications following full-thickness small intestinal biopsy in 66 dogs: a retrospective study. *J Small Anim Pract* 2005;46:317-321
7. Swinbourne F, Jeffery N, Tivers MS, et al. The incidence of surgical site dehiscence following full-thickness gastrointestinal biopsy in dogs and cats and associated risk factors. *J Small Anim Pract* 2017;58(9):495-503
8. Vaden SL, Levine JF, Lees GF, et al. Renal biopsy: a retrospective study of methods and complications in 283 dogs and 65 cats. *J Vet Intern Med* 2005;19:794-801