SURGICAL BIOPSIES  
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Analysis of cells exfoliated from abnormal areas of tissue, gathered either by fine needle aspirate or impression smear, is a useful and minimally invasive method for investigating lesions. However, tissue samples reflecting the architecture of the lesion examined histopathologically are usually required for definitive diagnosis. While it is nearly always prudent to examine a lesion via cytology first, biopsy (incisional or excisional) is often required before a definitive diagnosis can be reached and appropriate treatment can be instituted. The patient’s safety should be heavily weighed when considering biopsy and pain management should be instituted appropriately.

Incisional biopsies are often preferred to excisional biopsies in lesions where surgical margins may be important in prognosis or when the safety of the patient cannot justify excision in the absence of a definitive diagnosis. When performing an incisional biopsy, care MUST be taken not to expose a new tissue plane to tumor cells. Removing a wedge of tissue in an area that will be completely excised during a later procedure, or is within the treatment field of other subsequent therapies (such as radiation), is an appropriate strategy. With the exception of bone biopsy, when possible, a sample is taken at the junction of normal and abnormal tissue.

The following describes in brief some considerations for performing biopsies of various tissues:

**Oral cavity:**

Oral lesions are often accompanied by inflammatory tissue on their surface. Impression smears or superficial sampling may not reflect the true nature of the lesion. A biopsy extending into the deeper regions of the lesion may be required for accurate diagnosis. Due to the limitations of friable or immobile tissues, suture closure of the biopsy site may be difficult to achieve. While bleeding may seem profuse, digital pressure is often sufficient to control hemorrhage. This same ample blood supply also contributes to the rapid healing of oral tissue defects and gives a low infection risk. A full oral exam should be completed to evaluate for additional lesions. If the results of the biopsy will not affect the treatment plan, excisional biopsy should be considered. Long instrumentation may be required for lesion deep in the oral cavity.

**Small intestine:**

Biopsy of the small intestine is often required to definitively diagnose diffuse small bowel disease. While partial thickness endoscopic biopsies have become more common, the gold standard for diagnosis remains the full thickness surgical biopsy. It is important to adhere to good surgical principles when collecting intestinal biopsies to minimize the risk of complications. These include, but are not limited to, minimizing surgical trauma to the tissue, using approximating suture patterns, always engaging the submucosa, and taking measures to decrease the risk of contamination (isolating bowel with sponges, ample lavage, and replacing contaminated instruments). If other abdominal samples are to be collected (eg. lymph node, liver, pancreas), they should be collected before intestinal procedures to reduce the risk of contamination. Biopsies are collected via an enterotomy connecting two longitudinal incisions on the anti-mesenteric border of the bowel using a #11 scalpel blade and Metzenbaum scissors.
Alternatively, a punch biopsy instrument may be used (2-4mm). Stabilize the loop of bowel in question with the non-dominant hand, and roll the punch biopsy between the thumb and pointing finger of the dominant hand. The biopsy sample may remain within the punch biopsy and can be flushed out with saline. In the event the biopsy has released into the bowel you can often retrieve it by gently milking the biopsy site. Omentum can be applied to the biopsy site after closure to facilitate healing. Leaving the tags on your knots 2-3mm long will allow the omentum to attach to the biopsy site. Potential complications of intestinal biopsies include dehiscence, peritonitis, local abscess, hematoma, adhesions, and tumor seeding. Small intestinal biopsies in patients with concurrent disease, including hypoalbuminemia, are often required to complete a full workup. While low serum albumin is known to retard wound healing, an increased risk for postoperative complications has not been noted in hypoalbuminemic dogs undergoing small intestinal biopsy. In fact, a study investigating complications following full thickness intestinal biopsy in 66 dogs concluded there were no consistent predictors for patients at an increased risk of enteric wound breakdown.

Liver:

There are many indications for liver biopsy in clinical veterinary practice. These may include persistent elevation of liver enzymes, persistent abnormalities of liver function tests, staging of cancer, sampling abnormal appearing regions during an exploratory, differentiating acute from chronic disease, and evaluating hepatic response to treatment. Ultrasound guided aspirates and needle biopsies have a limited role in the diagnosis of liver disease as the results of these tests can be inaccurate, and many disease processes are diagnosed based on architecture of the cells and not small cell samples. A recent study observed an overall agreement between fine needle aspirate cytology and surgical biopsy in only 30.3% of dogs and 51.2% of cats. Laparoscopic liver biopsy allows for adequate sample acquisition with minimal risk and trauma, but requires specialized equipment and expertise. The classic approach to liver biopsy, via a laparotomy, allows for full investigation of the liver parenchyma and substantial sample collection. Liver biopsy should be performed early during an exploratory laparotomy to give time to ensure adequate hemostasis is achieved before closure. Indeed, bleeding is the main complication of note when collecting liver biopsies. Analysis of coagulation (platelet count, BMBT, PT/PTT) should be performed/considered before attempting collection of liver biopsy samples. Common techniques used to collect surgical liver biopsies are the suture fracture (or guillotine) technique and the use of a punch biopsy instrument. For diffuse disease, collecting a sample from the edge of a liver lobe with the suture fracture technique allows for the collection of a large sample and provides good hemostasis. If a larger sample is desired, several overlapping guillotine sutures can be placed proximal to the proposed resection site. For lesions located more centrally on the liver lobe, where suture fracture is not practical, a punch biopsy instrument is useful for sample collection. In either case, but especially after punch biopsy, hemostatic agents like Gelfoam®, AnimalClot/SurgiClot®, combined with patient digital pressure, are indispensable in controlling hemorrhage. Finally, it is important to consider sample submission requirements when collecting liver biopsies. Typically, samples are collected for histopathologic analysis, bacterial culture, and/or heavy metals analysis. It is also common to take an aspirate of the gall bladder contents for cytologic evaluation and culture if indicated.
Spleen:

Lesions of the spleen are commonly encountered in cats and dogs. Splenic biopsy is often indicated to diagnose primary or metastatic disease or as a palliative and diagnostic measure (as in the case of a ruptured splenic mass). Many times, abnormalities of the spleen are discovered as an incidental finding. Percutaneous needle aspiration is often performed, but the technique is relatively low yield and may even disagree with histopathologic diagnoses. A recent investigation of splenic aspirates noted that cytologic diagnoses corresponded with histologic diagnoses in only 61.3% of cases and differed in 16.1% of cases. If ultrasound evaluation of a splenic pathology discovers a cavitary lesion, the diagnostic yield of splenic aspiration is far outweighed by the risk of rupture and acute hemorrhage. Individual nodules may be isolated and resected using the overlapping guillotine sutures as described for liver biopsies. For larger lesions located at the far head or tail of the spleen, partial splenectomy may be an option. Often, however, it is easier and more prudent to excise the entire spleen and submit the whole organ for analysis. If a cavitary lesion is noted, it should be ruptured prior to placement in formalin. The organ should also be “bread loafed” to allow adequate formalin fixation to provide the best opportunity for an accurate diagnosis. If the entire spleen is removed, the patient should be monitored closely for ventricular arrhythmias and blood loss after surgery.

Pancreas:

Certain pancreatic lesions may provide an indication for pancreatic biopsy. Pancreatitis in the cat is often hard to diagnose and biopsies of the pancreas are taken more often than in the dog. If diffuse disease is suspected, removing a small portion of the caudal aspect of the right limb of the pancreas via a guillotine technique is advisable. When using this technique, an absorbable monofilament suture should be used. Braided suture should be avoided and the use of chromic gut is contraindicated as it is rapidly digested by local enzymes and could serve to promote a local inflammatory reaction. The entire pancreas should be examined for evidence of multifocal disease. While the right limb of the pancreas is easily examined in the mesoduodenum, the left limb can be more difficult to visualize completely. The entire omentum should be raised to visualize the dorsal aspect of the left limb as it lies adjacent to the greater curvature of the stomach. A hole may need to be created in the omentum to visualize the opposite surface of the left limb and gain access to certain focal lesions for biopsy. The most common complication of pancreatic biopsy is pancreatitis. Gentle tissue handling, judicious sampling and ensuring adequate perfusion during and after anesthesia are critical to decrease the risk of complications.

Kidney:

Kidney biopsy may be indicated in cases of suspected glomerulonephropathy, undiagnosed proteinuria, infiltrative renal disease, and in certain instances of acute renal failure. To that end, biopsies often target the renal cortex. A Tru-Cut® biopsy instrument is guided tangentially, just below the renal capsule, to ensure that adequate numbers of glomeruli are collected, laceration of an arcuate vessel in the medulla is avoided, and penetration of the renal pelvis resulting in urine leakage is prevented. Alternatively, a wedge of cortical tissue is harvested with a #15 scalpel.

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blade. A mattress suture using an absorbable monofilament suture with or without a topical hemostatic agent is appropriate for closure. Patient digital pressure is also useful in both cases to control bleeding. In certain instances, samples should be collected in special media (other than formalin) for analysis (for electron microscopy, for example).

**Lymph node:**

Lymph nodes are often biopsied, either with incisional or excisional techniques, in a variety of disease conditions. There are generally no clear contraindications for lymph node biopsy and the information gained can be invaluable in diagnosing and staging disease. Lymph nodes that can be easily isolated and visualized, such as mesenteric nodes, can be biopsied via complete excision, partial excision, or by wedge technique. Surgical excision provides perhaps the best possible specimen for examination. If complete excision is chosen, dissection should proceed carefully so as not to damage surrounding structures. Large nodes often have an associated vessel that requires ligation to ensure appropriate hemostasis. Partial excision can be accomplished via the guillotine technique described earlier. Wedge biopsy may be useful in the case of very large nodes or those in areas where complete or partial resection presents an unsuitable risk to surrounding tissues. A #15 scalpel blade is used to remove a wedge of tissue and the defect is closed with a horizontal mattress suture. Peripheral nodes (prescapular, popliteal, etc.) are often more difficult to excise than one would imagine. Careful palpation and dissection throughout the procedure and the use of a stay suture(s) can help prevent getting lost in the surrounding fat and tissue planes. Before a lymph node biopsy is placed in formalin, it may be prudent to make impression smears of the cut surface to evaluate while waiting for histopathologic diagnosis.

**Skin:**

Skin biopsies are indicated for a vast array of conditions. In some instances it is important to ensure that secondary skin infections are eliminated prior to biopsy to ensure accurate results. Strict adherence to general biopsy principles is important for obtaining good skin biopsies. Taking samples at the junction of normal and abnormal tissue can enhance the diagnostic efficacy of the sample. It is also generally advised to submit samples for bacterial and/or fungal culture. However, taking care not to expose a new tissue plane to tumor cells is vital in the case of certain tumor (eg. fibrosarcoma). Many different techniques are used, but the use of punch biopsy instruments, or an elliptical incision with a standard scalpel blade, are effective techniques.

**Bone:**

Bone biopsy is indicated for the definitive diagnosis of bony lesions noted on physical exam and/or imaging. The principles of bone biopsy differ somewhat from the principles of soft tissue biopsy. Most importantly, samples should be obtained from the radiographic center of the lesion. Superficial samples will often return non-diagnostic results or ‘reactive bone’. Applied appropriately, the diagnostic accuracy of the Jamshidi needle and Michele trephine for lone bony lesions are reported to be 91.9% and 93.8% respectively. Preoperative radiographs and accurate measurement, or pin placement are essential to ensure a proper sample is collected. The skin
should be prepped with an aseptic technique to ensure that bacteria are not introduced to the biopsy site. A Jamshidi needle may be used when small sample collection is desired or a Michele trephine may be used to collect larger samples. Either instrument is advanced through the skin incision, down to the bone, before removing the stylet and advancing the instrument. The risk of pathologic fracture is less when a Jamshidi needle is used, but this comes at the cost of a smaller sample. To reduce the risk of pathologic fracture in either case, the far cortex of the bone is not penetrated. Intra-biopsy and post-biopsy radiographs should be obtained to document/ensure adequate sampling. In many cases, especially those involving the distal limb, it is wise to place either a soft padded bandage or a splint in the immediate post biopsy period.


Acknowledgements: Ryan Taggart, DVM, DACVS