

Diagnostic Considerations in Veterinary Oncology

Why worry about cancer in pets?

The diagnosis of cancer in companion animals has been increasing in prevalence (the number of overall reported cases, not the number of reported cases versus population at risk which is called incidence). Causes of increasing prevalence have been suggested as longer life spans for cats and dogs, better diagnostic tests, and more willingness on the part of clients to have these tests performed.

The human-animal bond has been documented to be strengthening over the years due to changes in traditional family structures. Pets are considered best friends, family, confidantes and sources of unconditional love that people may not have available otherwise. This fact, in combination with the increasing media coverage of cancer management breakthroughs in human oncology have caused many veterinary practice clients to seek the most advanced care available for their pets.

What is the starting point for diagnosing cancer in pets?

A possible cancer site is often immediately diagnosed by an observation of a nodule or mass identified at home by the family, or by the general practice veterinarian during a routine examination. If a nodule or mass is identified, a fine needle aspiration cytology is recommended for easily accessible sites such as the skin, or a small biopsy may be obtained if a sedative is necessary for less accessible sites such as the oral cavity or the ear canal. If fine needle aspiration cytology is non-diagnostic and a dermal nodule is still suspected to be malignant, then a small biopsy can be obtained to achieve a diagnosis.

It is not generally recommended to “just take out the mass and see what it is” because if a malignant cancer is diagnosed, then a second surgery will be necessary to obtain complete margins and the chance for cure may be compromised because the margins of normal tissue around the tumor have been disrupted and contaminated by the first surgery.

Cancer may be also be diagnosed when a patient presents with signs such as weight loss, vomiting, diarrhea, unexplained bleeding, coughing, or pain. The most basic of lab tests, which I refer to as the “minimum data base” is the combination of CBC, biochemical profile and urinalysis and is the first step toward determining a cause of the above problems. Cancer can be diagnosed or suspected on these lab tests if leukemia, hyperglobulinemia, hypercalcemia are present on the lab samples, or bladder tumor cells are noted in the urine specimen. In other cases, non-specific findings such as elevated liver enzymes or anemia may prompt further diagnostics such as ultrasound or radiographs.

In human oncology, there are blood tests that search for tumor related proteins, or antigens, that may identify very early cancer such as the PSA (Prostate Specific Antigen) test for prostate cancer. Contrary to what clients often believe, with the exception of

leukemia, at this time there is not a commercially-available blood test that will specifically identify cancer in our companion animals. In fact, in many veterinary patients identified with cancer, routine blood testing may be completely normal.

It is, of course, very important that we use the CBC/chem/UA tests to evaluate the general health of the cancer patient. This general health evaluation is particularly important when one considers that cancer is most often diagnosed in the aging veterinary patient population.

If a patient suffers from weight loss, vomiting, diarrhea, coughing or pain and the above laboratory testing is normal, thoracic radiographs and abdominal ultrasound are often the next step in pursuing a diagnosis. Lung masses, diffuse interstitial lung diseases, cardiac enlargement (pericardial effusion), enlarged intrathoracic lymph nodes, mediastinal masses and pleural effusion are cancer-related findings that can be observed on a thoracic radiograph. Bone and joint cancers are often identified when a persistently painful limb site is radiographed.

Diffuse hepatic and splenic disease, intestinal thickening, enlarged lymph nodes, abdominal effusion, or masses in any organ can be cancer-related findings that are identifiable using abdominal ultrasound. Ultrasound-guided sampling of these abnormal tissues is a non-invasive method of diagnosing the cause of these abnormalities.

In one report, when ultrasound-guided needle biopsies were performed by experienced individuals on dogs and cats with a variety of intra-abdominal diseases, minor complications were observed in 13 of 233 biopsies and major complications in 3 of 233 biopsies. 218 patients had needle biopsies correlated with subsequent exploratory surgery or necropsy. 15 patients had normal needle biopsies and no further confirmatory diagnostics were performed. No complications were reported in 70 patients following ultrasound-guided fine needle aspirates; 84.3% of FNA correlated with the ultimate diagnosis. In another report, 91% (n=56) of ultrasound-guided fine needle aspirates correlated with confirmed disease processes (majority were neoplastic).

How do we determine the extent of the cancer once a neoplastic process is identified?

Staging

Determination of the extent of a cancer process within the patient's body is called staging. Because the prognosis for many cancers (oral melanoma, mammary carcinoma, thyroid carcinoma, pulmonary carcinoma) has been linked to the size of the primary tumor, the simple act of obtaining a measurement of a primary tumor site can provide important prognostic determination. Determination of localized extent of tumor cannot always be identified by examination or radiograph alone. CT and MRI are of **much** greater value than radiography and even ultrasonography for local staging of, and therapeutic planning for oral, intra-nasal, intra-thoracic, intra-abdominal, and soft tissue neoplasms. For example, in one study, 17/26 subcutaneous neoplasms were determined to be more locally extensive following CT evaluation than physical examination or radiography had identified.

Lymph node evaluation

Regional lymph nodes are often the first site for tumor metastasis to be identified. Regional nodes may be internal (sternal for a tumor on the thoracic dermis or sublumbar for an anal sac tumor), therefore the clinician must remember to perform the appropriate diagnostic to identify the status of the associated regional node. Because studies have shown that lymph node metastasis can be identified cytologically even when nodes are normal in size, it is recommended that the draining lymph node for a primary tumor site be aspirated, if it can be safely done, even if it is normal in size.

Thoracic radiography

If a cancer is diagnosed outside of the chest cavity, we use thoracic radiographs to identify lung nodules, pleural effusion and intrathoracic lymph node enlargement which may represent sites of metastasis. At VSH we also have the ability to easily utilize a CT-scan of the lung field that may identify 10+% more lesions than a plain thoracic radiograph. Clinicians here will perform this test especially if they are already using a CT scan to evaluate the tumor margins in the primary tumor location, because of this increased sensitivity and the rapidity of this test using our state-of-the-art machine, or if a lesion is suspected on a thoracic radiograph. However, due to expense and anesthetic requirements, we do not perform CT scans of the thoracic cavity for every patient with cancer before they undergo therapy.

Ultrasonography is far superior to abdominal radiography for identifying mass lesions or enlarged abdominal lymph nodes that may represent secondary (metastatic) cancer sites. Clinicians may also use abdominal ultrasound as a general health screening tool for aging patients that are scheduled to be treated with an extensive procedure such as amputation or maxillectomy, a surgical procedure that requires skin grafting, or radiation therapy.

Laparoscopy and thoracoscopy

These techniques are utilized as non-invasive methods of biopsy of tissues that are not safely accessible by ultrasound-guidance (cardiac masses) or to non-invasively obtain larger specimens for more accurate diagnosis such as liver biopsies. These techniques are used to diagnose both primary and secondary sites of cancer.

Nuclear scintigraphy

This technique is utilized most often for thyroid neoplasms and osseous metastatic sites. Dogs w/ non-functional thyroid tumors (the most common variety) may have ^{99m}Tc-pertechnetate uptake. However, there appears to be questionable utility for use of this method for identification of pulmonary metastatic disease as compared to thoracic radiography. There does appear to be correlation between distribution of technesium uptake and capsular invasion and this technique was useful in identifying ectopic sites of neoplasia which may be valuable for surgical planning. Nuclear scintigraphic bone scans are sensitive but not specific methods for identification of osseous metastatic sites. In a summary of several reports of this method for detection of metastatic bone sites in dogs with appendicular osteosarcoma, between 1/70 and 14/25 patients had positive bone

scans. In the latter study, 7/14 of the bone lesions were confirmed histologically as osteosarcoma. Regions of osteoarthritis and osteomyelitis are also expected to be positive on these scans.

Polymerase chain reaction (PCR)

PCR is currently being utilized to identify clonal expansion of neoplastic lymphocytes and plasma cells in dogs and cats. This method is useful for differentiation between antigen-stimulated (reactive) and neoplastic populations of lymphocytes. It may also be useful for identification of systemic foci for lymphoid neoplasms. Unfortunately, there is occasional clonal lymphocyte expansion in patients infected with certain infectious organisms such as Ehrlichia spp. PCR technology may be used in the future for detection of minimal residual disease (identification of metastatic cells or residual local neoplastic cells) with markedly improved sensitivity compared to traditional screening methods (imaging, cytology, histology). Another future potential use of PCR will be to differentiate metastatic cells from normal resident cells in regional nodes, blood, or distant organs for neoplasms such as mast cell tumors. For example, if a specific genetic mutation is determined to be present only in neoplastic mast cells vs. normal mast cells, current staging techniques would have vastly improved specificity, as well as sensitivity for neoplastic cell detection.

The level of diagnostic sophistication that we have available for our veterinary oncology patients is ever-increasing. These diagnostics will continue to improve our ability to treat our patients more effectively and to make the best treatment choices for our patients and their families as they battle cancer in their beloved companions.