

Question

Which of these tests would you recommend before taking a dog with mammary carcinoma to surgery?

- PTH-rP assay
- Fine needle aspirate
- Chest radiographs
- Abdominal radiographs

Explanation - The correct answer is chest radiographs. 50% of mammary masses in dogs are malignant, and the thorax is the most likely site of spread. Fine needle aspirates do not distinguish benign from malignant mammary masses, and surgical removal with histopathology is the only way to make the determination.

Question

Which of these tumor types is associated with causing GI ulcers, perioperative hypotension, and coagulation abnormalities in dogs?

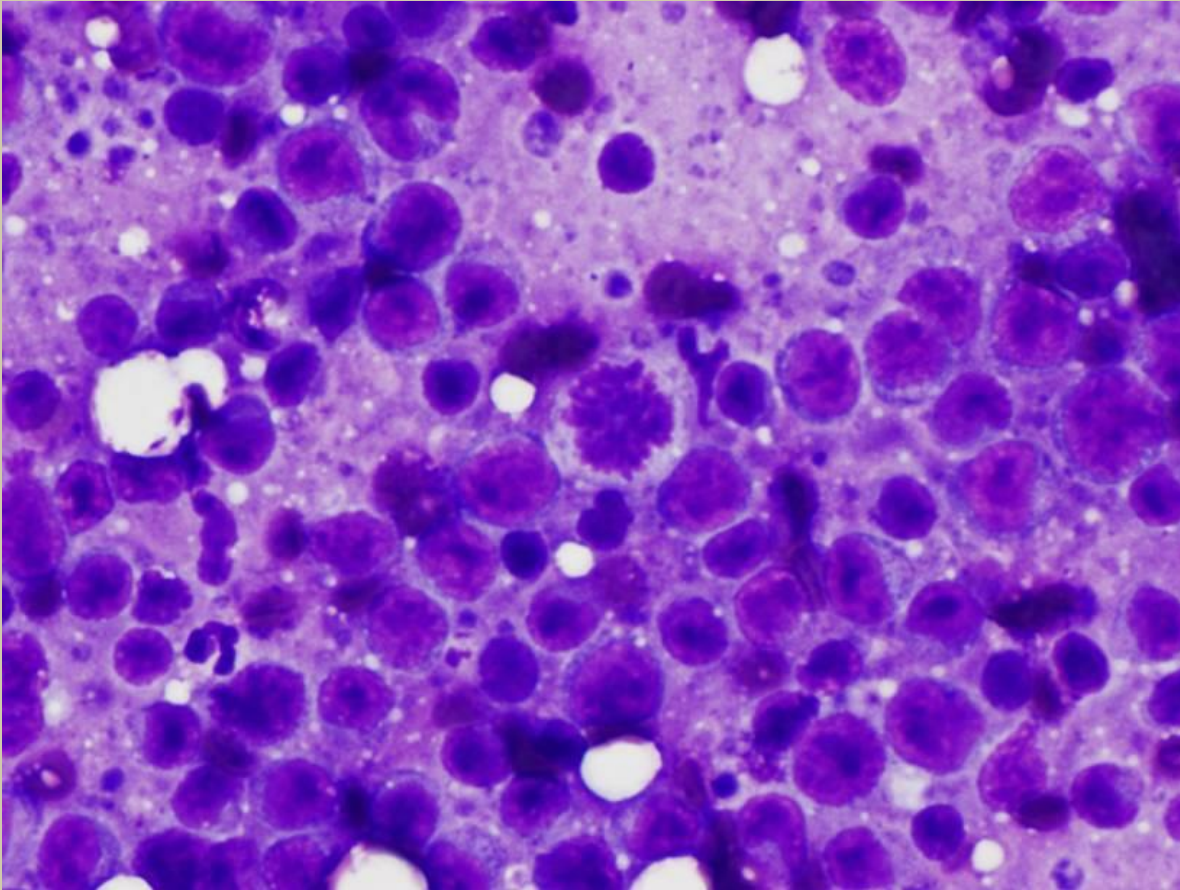
- Mast cell tumors
- Lymphoma
- Melanoma
- Hemangiosarcoma

Explanation - The correct answer is mast cell tumors. Many of the clinical signs of mast cell tumors are related to the factors released by mast cells including histamine, heparin, and other vasoactive amines. Histamine can cause ulcers via activation of H2 receptors on gastric parietal cells. Heparin can cause coagulopathy. Histamine and other vasoactive amines can lead to vasodilation and hypotension.

Question

A 7-year old female Lhasa Apso presents to you for lethargy and inappetence. On your exam, you detect mandibular lymphadenopathy and perform a fine needle aspirate. You see the aspirate depicted here. Which of these treatments would be given to this patient as part of a first line therapy?

- Prednisone
- Milbemycin
- Doxycycline
- Itraconazole
- Carboplatin



Explanation - This is a case of lymphoma. The cytology depicts the classic finding of a population of lymphoid cells that are predominantly lymphoblasts based on their size and characteristics. If you were unsure about their size due to magnification, there is a neutrophil in the lower left corner for comparison. The lymphoblasts are considerably larger than the neutrophil. Mature lymphocytes would be smaller than a neutrophil. Note that there is a mitotic figure in the middle of the slide.

There are many treatments and protocols for lymphoma and some of the main agents known to have efficacy are prednisone, doxorubicin, cyclophosphamide, vincristine, L-asparaginase, and lomustine. There are many other efficacious chemotherapeutics for lymphoma but carboplatin is not considered a first line treatment for lymphoma in dogs. The median survival time for most dogs on chemotherapy is approximately one year with 25% of dogs surviving two years.

The other drugs listed are antifungal (itraconazole), antibiotic (doxycycline) and anti-parasitic (milbemycin).

Malignant lymphoma or lymphosarcoma is one of the most common neoplasms in dogs. They usually originate in lymphoid tissues, like the lymph nodes, spleen, and bone marrow. However, they can arise in any tissues in the body. Lymphoma accounts for approximately 7-24% of all canine neoplasia and 83% of all canine hematopoietic malignancies. Lymphoma is generally seen in middle aged to older dogs (6-9 years). Breeds that are believed to have a higher incidence of lymphoma comprise Boxers, Bull Mastiffs, Basset Hounds, Saint Bernards, and Bulldogs. Neutered females tend to have a better prognosis.

World Health Organization (WHO) has classified different stages of lymphoma based on its degree of metastasis and invasiveness. They are as follow:

- Stage I: Ailment restricted to a single lymph node.
- Stage II: Regional lymphadenopathy (restricted to one side of diaphragm).
- Stage III: Generalized lymphadenopathy (enlargement of lymph nodes)
- Stage IV: Enlargement of the liver and spleen or hepatosplenomegaly (with or without lymphadenopathy)
- Stage V: Bone marrow, CNS (Central Nervous System), or involvement of other extranodal sites

Question

Which of the tumors listed is considered a "soft tissue sarcoma" due its locally invasive behavior and relatively low metastatic rate for most low and intermediate grade tumors?

- Basal cell tumor
- Hemangiosarcoma
- Peripheral nerve sheath tumor
- Histiocytic sarcoma
- Osteosarcoma
- Mast cell tumor

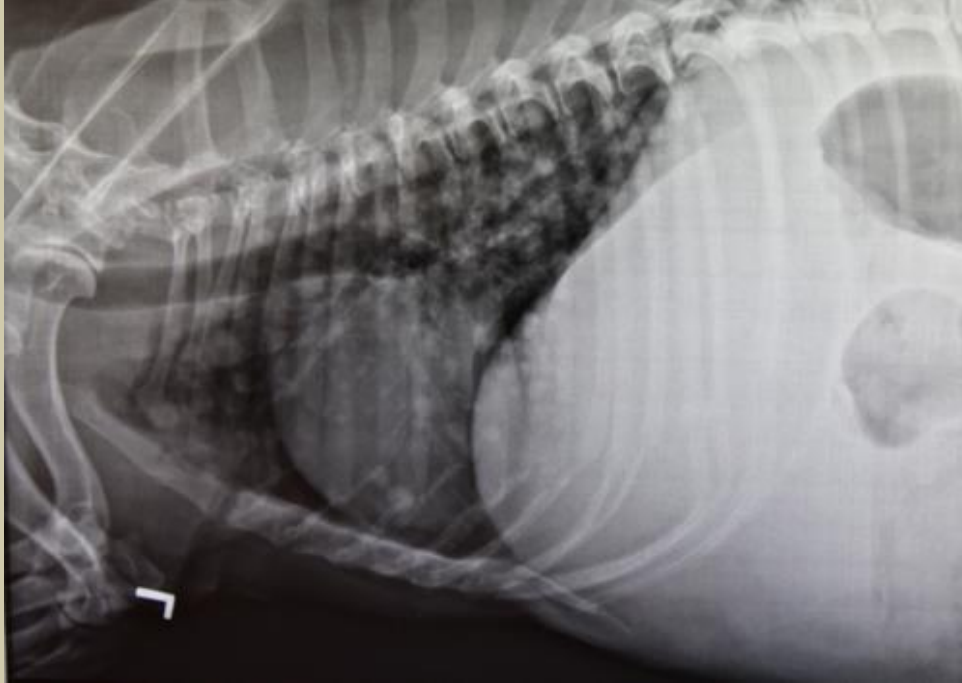
Explanation - Soft tissue sarcomas include a group of mesenchymal tumors with similar biologic behavior, namely a locally invasive growth pattern and a metastatic rate of less than 20% for low- and intermediate-grade tumors. High-grade tumors have up to a 50% metastatic rate.

These tumors include peripheral nerve sheath tumors (PNST), hemangiopericytomas (HPC), fibrosarcomas (FSA), liposarcomas, malignant fibrous histiocytomas, myxosarcomas, rhabdomyosarcomas, and leiomyosarcomas.

Hemangiosarcoma and osteosarcoma are mesenchymal in origin but are not lumped into this category due to their highly metastatic behavior. Histiocytic sarcoma and mast cell tumors are considered of round cell origin. Basal cell tumors are epithelial in origin.

Question

A 12-year old mixed breed MC dog presents to an emergency clinic with a history of increased respiratory rate, anorexia, lethargy, inappetance and a soft cough over the past 3 days. One week ago the patient had a large mass removed from the left pelvic limb. The owners are unable to tell you the diagnosis of the mass. On physical exam, the patient is depressed, has slightly decreased lung sounds, and the incision associated with mass removal is intact. Chest radiographs were performed as shown in this image. What is the radiographic diagnosis and appropriate treatment?



- The patient has severe aspiration pneumonia and should be started on broad spectrum antibiotics, IV fluids, and oxygen support
- The patient has severe bronchoconstriction and a bronchodilator should be prescribed
- The patient has severe pulmonary edema secondary to heart failure and furosemide should be administered
- This patient has metastatic lesions throughout the lungs and only palliative treatment can be recommended

Explanation - This dog was not staged prior to surgical removal of the mass and likely had visible metastatic nodules at the time of surgery. The only other potential differential with this radiographic finding would be granulomatous disease which is unlikely given the history.

Question

A 2-year old female spayed Dachshund presents for further evaluation as a result of a mass on the pinna noted by the owner. On physical exam, the only abnormality noted was this mass. Cytology is consistent with a histiocytoma. Which of the following is the most reasonable treatment option?

- Benign Neglect
- Radical surgical excision
- Radiation therapy
- Cryotherapy
- Chemotherapy using lomustine



Explanation - Histiocytomas are typically benign and will often present as a small, raised mass that may or may not be ulcerated. Fortunately, these masses usually regress on their own, and surgical or medical intervention is typically not necessary.

Question

On physical examination of a dog, you find the mass depicted here projecting from the margin of the upper eyelid. What is the most likely diagnosis?

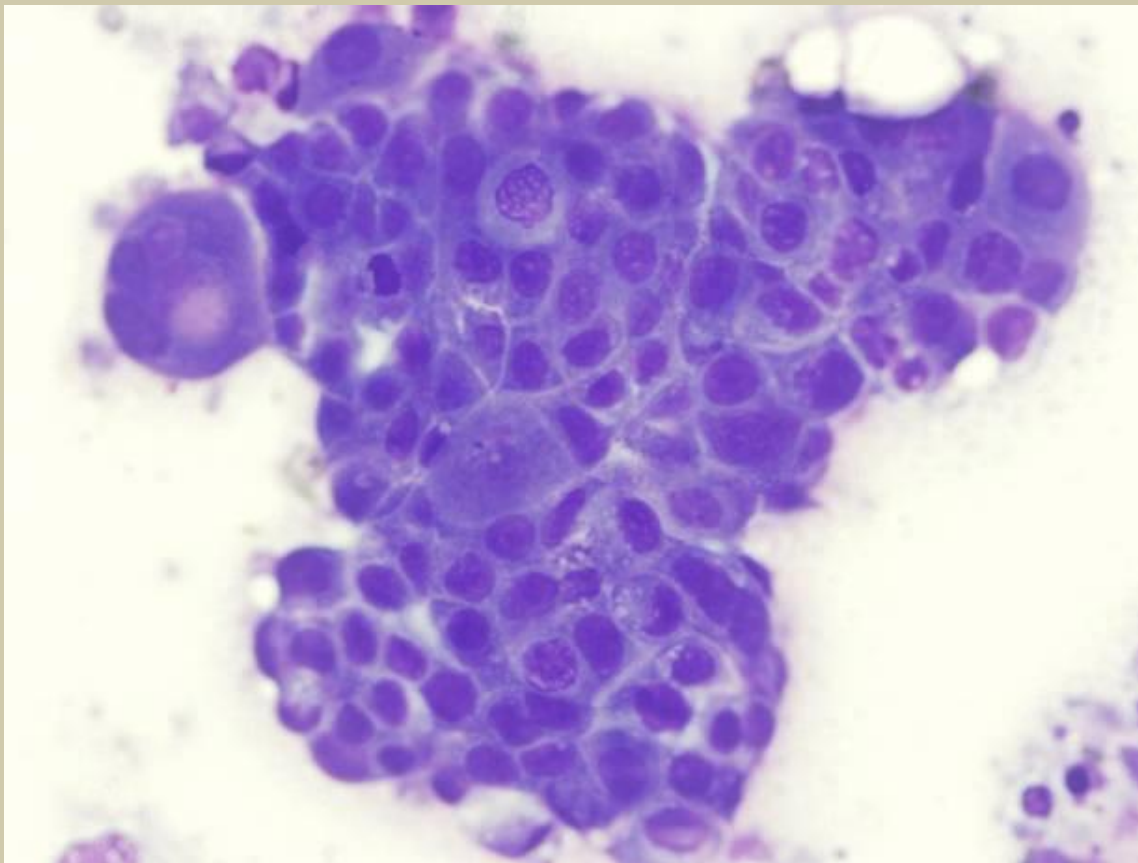


- Chalazion
- Melanoma
- Entropion
- Meibomian adenoma

Explanation - The correct answer is meibomian adenoma. The description fits the appearance and location of a meibomian gland adenoma. This is the most common ocular tumor of the dog and is usually benign. A chalazion is an obstruction of the meibomian gland and appears as a swelling within the eyelid rather than projecting from it. Entropion is an infolding of the eyelid. Melanoma is a reasonable differential but is less common, especially with the location of this mass at the eyelid margin.

Question

The image below is from an aspirate taken through the soft palate from a mass in the nose of an 8-year old male neutered Rhodesian Ridgeback dog. Choose the correct cell type of origin AND classification.



- Mesenchymal origin; sarcoma
- Leukocyte origin; round cell tumor

- Epithelial origin; carcinoma
- Mesenchymal origin; carcinoma
- Mesenchymal origin; round cell tumor
- Epithelial origin; sarcoma

Explanation - This is a nasal adenocarcinoma. The classification scheme for tumors by cell of origin and cytologic description is:

Carcinoma- These tumors come from epithelial cells including cells of glandular tissues such as salivary glands, mammary glands, and cells lining most tissues including squamous cells or transitional cells. The cytologic appearance is that of COHESIVE CLUSTERS of cells. Here, you can see some of the tight cellular junctions in the cluster which is typical. Cells are often polygonal in shape.

Sarcoma- These tumors come from mesenchymal cells and are named by the specific cell type such as fibroblasts (fibrosarcoma) and osteoblasts (osteosarcoma). Cytologically, they tend to appear as isolated spindle-shaped cells with elongated cytoplasm and often oval nuclei.

Round cell tumors- There are 5 round cell tumors and most but not all come from blood cells. They are lymphoma, mast cell tumors, plasma cell tumors, histiocytic tumors, and transmissible venereal tumors. Remember, these are also sometimes also referred to as sarcomas (i.e. lymphosarcoma or histiocytic sarcoma). Cytologically, they appear usually as large populations of cells that are not in defined clusters. The cells have a round shape, often with unique identifiable features such as the purple granules in mast cell tumors.

Question

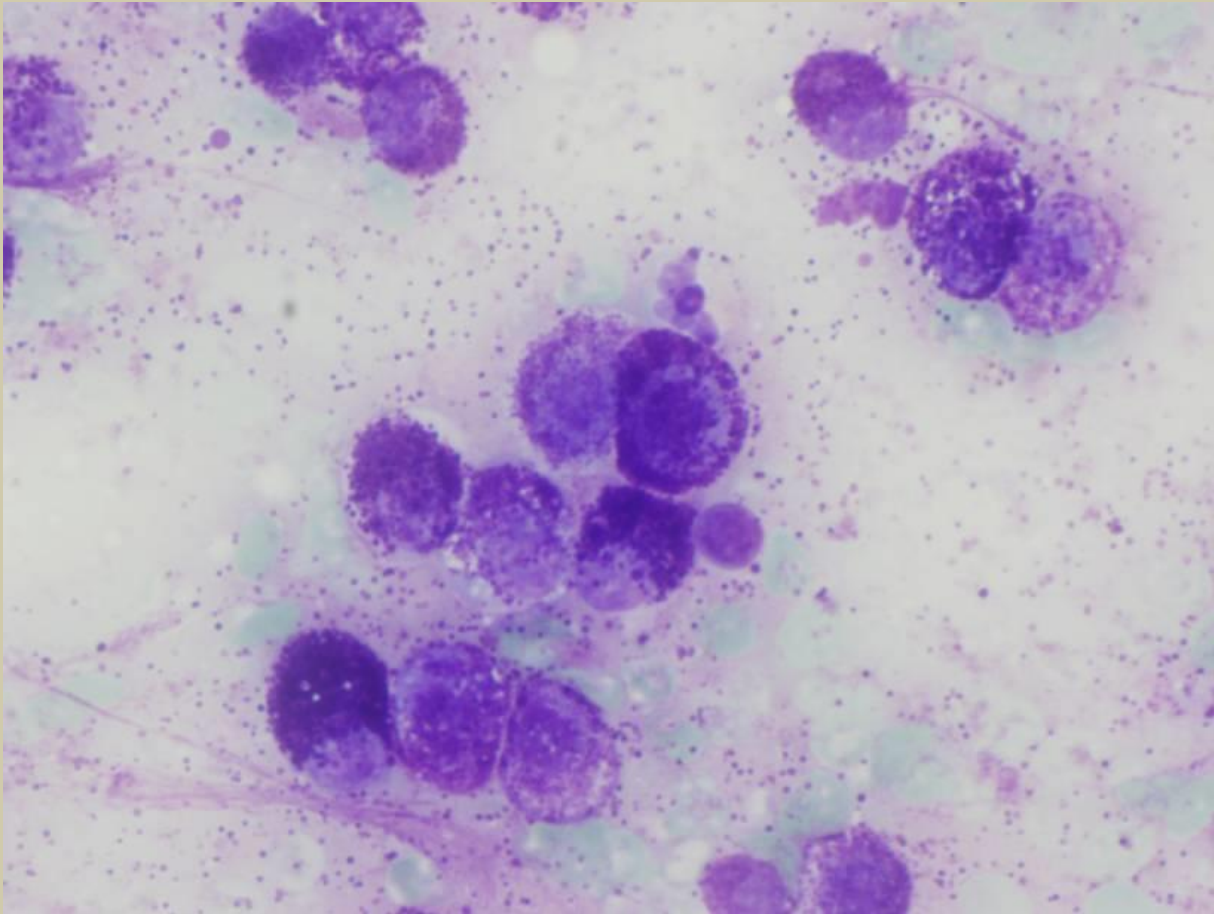
Which of the following is a common finding on a complete blood count in a dog with a ruptured splenic hemangiosarcoma?

- Heinz body anemia
- Neutropenia
- Schistocytes
- Thrombocytosis
- Eosinophilia

Explanation - Schistocytes are fragmented red blood cells that are mechanically broken up due to the irregular vessels and fibrin strands they pass through in hemangiosarcoma patients. Other typical findings on a CBC in a patient with hemangiosarcoma are thrombocytopenia, anemia (although not with Heinz bodies), and leukocytosis.

Question

Which of the following is not an appropriate medical treatment for a dog with a tumor of the cells shown in the image?



Vinblastine (Velban)

Famotidine (Pepcid)

Prednisone

Piroxicam

Diphenhydramine (Benadryl)

Explanation - This is an example of a mast cell tumor. All of the choices are acceptable treatments except for Piroxicam. Because mast cells contain and secrete histamine, administration of an H2 antagonist such as famotidine and an H1 antagonist such as diphenhydramine can reduce systemic signs associated with histamine release. Prednisone and Vinblastine are both appropriate chemotherapeutics for mast cell tumors in dogs. Piroxicam is a cyclooxygenase inhibitor (NSAID) and is not an effective chemotherapeutic for mast cell tumors. Additionally, its potential to cause adverse side effects to the stomach and small intestine can increase the risk of gastroenteritis or perforation in a dog with hyperhistaminemia.

Question

A 9-year old Cocker Spaniel presents to you for multiple small (3-6 mm) skin masses. The owner describes them as cauliflower-like. Some appear to be ulcerated. What is the most likely diagnosis?

- Cutaneous lymphosarcoma
- Squamous cell carcinoma
- Mast cell tumor
- Sebaceous gland tumor

Explanation - The correct answer is sebaceous gland tumor. These are actually the most common skin tumor in the dog. This group of tumors includes sebaceous hyperplasia, sebaceous epithelioma, sebaceous adenoma, and sebaceous adenocarcinoma. They are usually found in older dogs and are especially common in Cockers, Beagles, Poodles, and Miniature Schnauzers. They usually look like wart- or cauliflower-like lesions < 1 cm and can occur anywhere but usually are seen on the limbs, trunk, and eyelids.

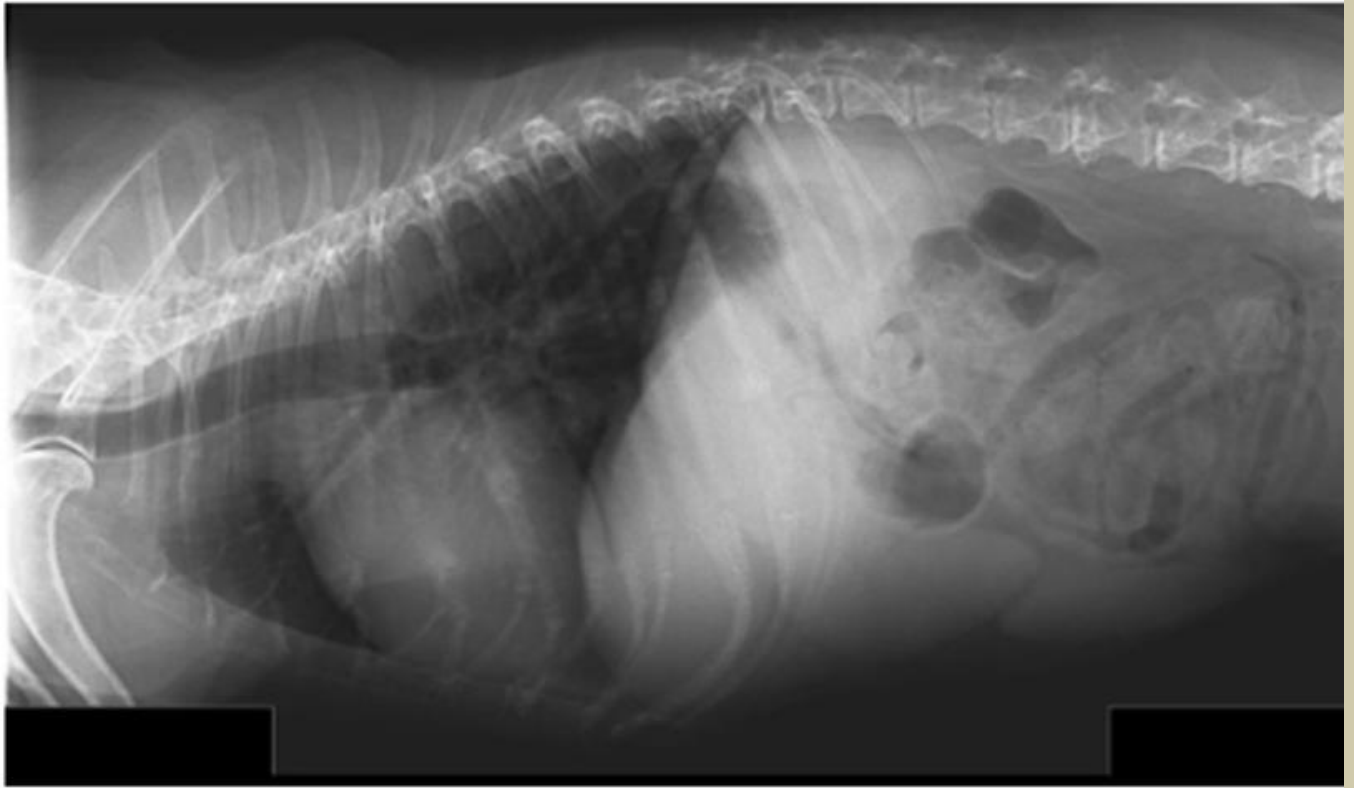


Question

A 6-year old Schipperke presents with a 1-month history of progressive weakness and decreased appetite. The owner reports the dog is slightly **polyuric** and **polydipsic**. Your physical exam is unremarkable except that the dog seems subdued and a bit uncomfortable. You perform bloodwork which shows the following results:

Hematocrit - 28% (Normal 36%-50%)
White Blood Cell Count - 16,000/ul (Normal 7,000-17,000/ul)
Thrombocytes - 324,000/ul (Normal 200,000-900,000/ul)
Calcium - 13.2 mg/dl (Normal 8-11 mg/dl)
Phosphorus - 2.9 mg/dl (Normal 2.4-4.9 mg/dl)
Total Bilirubin - 0.1 mg/dl (Normal 0.06-0.61 mg/dl)
Total Protein - 7.2 g/dl (Normal 5.5-7.3 g/dl)
Albumin - 2.3 g/dl (Normal 2.2-4.2 g/dl)
Globulins - 4.9 g/dl (Normal 2.6-4.5 g/dl)
Alkaline Phosphatase - 45 IU/l (Normal 10-80 IU/l)
Aspartate Aminotransferase - 8 IU/l (Normal 0-20 IU/l)
Alanine Aminotransferase - 17 IU/l (Normal 3-33 IU/l)
Gamma-Glutamyl Transferase - 2 IU/l (Normal 1.3-12 IU/l)
Blood Urea Nitrogen - 17 mg/dl (Normal 10-22 mg/dl)
Creatinine - 1.4 mg/dl (Normal 0.5-2.2 mg/dl)
Glucose - 96 mg/dl (Normal 60-125 mg/dl)
Cholesterol - 180 mg/dl (Normal 125-250 mg/dl)

You perform whole-body radiographs which are shown below. Which of the following choices are two tests that will help you confirm the most likely diagnosis?





- Urinalysis, renal biopsy
- Ultrasound of neck, measure serum parathyroid hormone
- Bone marrow biopsy, serum electrophoresis
- ACTH stimulation test, dexamethasone suppression test
- Echocardiogram, heartworm antigen test

Explanation - This dog has signs and bloodwork findings that are consistent with but not specific for **multiple myeloma**. The hypercalcemia and hyperglobulinemia are both mild and are consistent with this diagnosis but would not be sufficient alone to jump to that conclusion. The key finding in these case is the radiographic evidence of multiple punctate lucencies including in the body of C4, several of the thoracic dorsal spinous processes, the left ilium, and the right and left humeral diaphyses. These lesions are strongly suggestive of multiple myeloma; however, definitive diagnosis of multiple myeloma requires satisfying at least two of the following criteria:

1. Monoclonal gammopathy
2. Radiographic evidence of osteolytic bone lesions (satisfied in this case)

3. >5% neoplastic cells or >10-20% plasma cells in the bone marrow
4. Immunoglobulin light chain proteinuria (Bence-Jones proteinuria)

Therefore, the best answer in this question is to perform serum electrophoresis to assess monoclonal gammopathy and a bone marrow biopsy to look for neoplastic infiltration of plasma cells.

Question

Which of these is a major potential adverse side effect of the chemotherapeutic drug cyclophosphamide in a dog?

- Anaphylaxis
- Cystitis
- Cardiotoxicity
- Nephrotoxicity
- Ileus

Explanation - The correct answer is cystitis. In addition to the usual side effects of chemotherapeutic drugs such as myelosuppression and GI side effects, a major concern with cyclophosphamide administration is causing sterile hemorrhagic cystitis due to a breakdown product of the drug called acrolein. To reduce this risk, animals should be encouraged to drink lots of water or be given fluids and encouraged to urinate frequently to prevent the toxic compound from sitting in the bladder for a long time. The drug that causes cardiotoxicity is doxorubicin. The drug that causes ileus is vincristine. The drug that causes anaphylaxis is L-asparaginase. The drug that causes nephrotoxicity is cisplatin.

Anti-neoplastic	Side Effect
L-Asparaginase	Anaphylaxis
Cyclophosphamide	Cystitis
Doxorubicin	Cardiotoxicity
Cisplatin	Nephrotoxicity
Vincristine	Ileus

Question

Two 9-year old female spayed Labrador retrievers presented for their next chemotherapy treatments. Both were diagnosed with multicentric lymphoma and have been receiving the CHOP protocol. One received doxorubicin (Adriamycin) and one received vincristine (Oncovin) today. Your technician informs you that both unfortunately had extravasations occur and wants to know what she should do. Which drug is a worse vesicant and what should be done to the injection site?

- Doxorubicin. Cold compress to contain the spread of drug

- Vincristine. Cold compress to contain the spread of drug
- Doxorubicin. Warm compress to disperse the drug
- Vincristine. Warm compress to disperse the drug

Explanation - Intravenous chemotherapy drugs can cause severe tissue necrosis (doxorubicin) or irritation (vincristine) if extravasation occurs. Treatment for both should begin immediately. In both cases, the catheter should be left in place and as much of the drug should be aspirated as possible. Treatment for doxorubicin extravasation involves cold compressing the site to promote vasoconstriction, however perivascular necrosis may still occur and may progress days to weeks later. In severe cases involving doxorubicin, debridement or limb amputation may be needed.

Vincristine extravasation should be treated with warm compresses to disperse the drug and enhance systemic absorption.

Extravasation should be prevented through patient restraint training, use of catheters that have been placed on the first stick, and careful monitoring during administration. The peripheral veins should be avoided for blood draws if possible on all patients receiving chemotherapy.

CHOP is the acronym for a chemotherapy regimen used in the treatment of lymphoma. CHOP consists of:

- Cyclophosphamide
- Hydroxydaunorubicin (also called doxorubicin or Adriamycin)
- Oncovin (vincristine)
- Prednisone or prednisolone.

Question

Which of these is the least common cause of morbidity and mortality of anal sac adenocarcinomas in dogs?

- Renal damage
- Bowel obstruction by the primary tumor
- Metastatic disease
- Pelvic canal obstruction by local lymph nodes

Explanation - The answer is bowel obstruction by the primary tumor. Apocrine gland anal sac carcinomas are usually very small (often < 1 cm). The usual clinical signs and problems come from either local or distant metastasis or from hypercalcemia due to secretion of PTH-rP by the tumor cells. Even a 1 cm tumor frequently affects local lymph nodes and can cause marked lymphadenopathy and pelvic canal obstruction. These tumors frequently metastasize early and they frequently cause hypercalcemia which can lead to renal damage.

Anal sacs lie **just inside the anus** of most carnivorous species. They are **paired structures** (one sac on each side of the anus), which are lined by many glands. These glands produce secretions that are expelled in small quantities with each bowel movement as a form of **territorial marking**.

Anal sac tumors arise from the glands of the anal sac, and may be benign (anal sac adenomas) or malignant (anal sac adenocarcinomas)—**most anal sac tumors are of the malignant** type. There are no obvious breed predilections and this type of tumor occurs in both intact and neutered animals. Anal sac adenocarcinoma is **very rare in cats**, but has been reported.

The tumor itself is usually unilateral; however bilateral tumors have been recognized. The mass can be very small (**less than 1 cm in diameter**) or quite large (up to 10 cm or more in diameter). It frequently produces a hormone which causes **blood calcium levels to rise** above normal levels. This is known as hypercalcemia of malignancy, and can cause problems with other organs such as the **kidneys**. In addition, anal sac adenocarcinomas have often metastasized by the time they are initially diagnosed. They may spread first to regional lymph nodes, such as the sublumbar lymph nodes, and later to the lumbar spine or more distant sites such as the liver, spleen, or lungs.

Common clinical signs of affected animals include **difficult or painful bowel movements, straining** to have a bowel movement, **ribbon-like stools**, or swelling of the area around the anus. If hypercalcemia is present, other signs such as increased thirst, increased urination, decreased appetite, weight loss, vomiting, muscle weakness, and low heart rate may be noted.

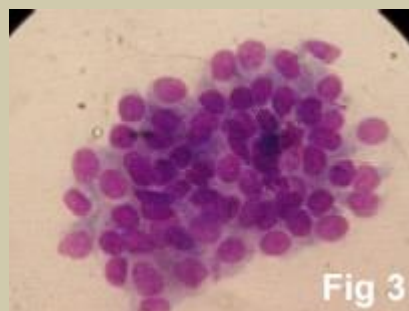
Anal sac adenocarcinomas are usually identified during **rectal palpation** (Fig 1 and 2 show a large anal sac tumor), although these tumors are not always obvious when the anal sacs are palpated. During the rectal examination, it may also be possible to palpate enlarged sublumbar lymph nodes.

If a tumor of the anal sac is palpated, CBC, serum chemistry profile, and urinalysis should be performed to identify possible **hypercalcemia**, evaluate systemic health, and help identify any other abnormalities. About 50% of these patients will have high blood calcium levels.

In addition, abdominal radiographs (X-rays) and abdominal ultrasound should be performed to evaluate internal organs and look for evidence of metastatic disease. Chest X-rays may also be needed to check the lungs for evidence of tumor spread.

The definitive diagnosis of anal sac adenocarcinoma, however, must be made by surgically removing the tumor or biopsy and histopathology.

The treatment of choice for anal sac adenocarcinoma is complete surgical excision



Question

You are treating a dog with lymphoma with prednisone, L-asparaginase and vincristine at the same time. Thirty minutes after administering all 3 drugs, the dog begins to vomit intractably, have diarrhea, and is weak and unable to get up. Pulses at that time are weak on palpation and his mucous membranes are pale pink. He recovers a few hours after being treated. Which of the following changes should be made to the remainder of this dog's chemotherapy protocol?

- Remove L-asparaginase from the protocol
- Remove prednisone from the protocol
- Discontinue the current protocol and switch to lomustine chemotherapy
- Remove vincristine from the protocol

Explanation - The signs described above are consistent with anaphylaxis, a potential side effect of treatment with L-asparaginase. Vincristine can also cause vomiting and diarrhea, but it usually takes a few days before they start, as opposed to within an hour of administration as seen with allergic reactions to L-asparaginase.

Question

A 12-year old male neutered Terrier mix presents for a geriatric exam. Physical exam reveals mildly prominent mandibular, prescapular, and popliteal lymph nodes, and a prominent spleen.

Routine blood work shows a CBC with a hematocrit of 35%, reticulocytes 45,000/uL, neutrophils 3,000/uL, lymphocytes 40,000/uL, monocytes 900/uL, eosinophils 200/uL, platelets 120,000/uL. A bone marrow aspirate shows 40% small lymphocytes. A mandibular lymph node aspirate shows 90% small lymphocytes. What is the cause for these findings?

- Acute lymphoid leukemia
- High grade lymphoma
- Acute myelogenous leukemia
- Chronic myelogenous leukemia
- Chronic lymphocytic leukemia

Explanation - 'Chronic' describes the clinical course of the disease, which is considered indolent or slowly progressive. The neoplastic cells of chronic leukemias are well differentiated or mature cells; therefore, CLL is considered a chronic or indolent form of leukemia made up of small, mature lymphocytes. These are difficult to distinguish from normal lymphocytes. The mildly prominent lymph nodes and prominent spleen are classic findings for chronic leukemias. The large disease burden within the bone marrow and relatively less affected lymphoid tissues (relative to lymphoma) makes this a lymphocytic leukemia as opposed to a small cell or low grade lymphoma.

Leukemia

Leukemia is cancer of the blood cells, usually affecting the white blood cells, which causes these cells to not work properly. There are four main types of leukemia.

Leukemia can occur in either the lymphoid or myeloid white blood cells. Cancer that develops in the lymphoid cells is called lymphocytic leukemia. Cancer that develops in the myeloid cells is called myelogenous leukemia. The disease can be either acute or chronic.

Acute leukemia involves new or immature cells, called blasts, which remain very immature and cannot perform their functions. The blasts increase in number rapidly, and the disease progresses quickly. In chronic leukemia, there are some blasts present, but they are more mature and can perform some of their functions. The cells grow more slowly so the disease progresses gradually. Based on these findings, leukemia is then classified into one of the four main types of leukemias—acute myelogenous leukemia (AML), chronic myelogenous leukemia (CML), acute lymphocytic leukemia (ALL), or chronic lymphocytic leukemia (CLL). In addition to these, there are other types and subtypes of leukemia.

Lymphoma

Lymphoma is a type of cancer that originates in the lymphatic system. There are two main types of lymphoma. Hodgkin's lymphoma, or Hodgkin's disease, causes the cells in the lymphatic system to abnormally reproduce, eventually making the body less able to fight infection. All other types of lymphoma are called non-Hodgkin's lymphomas. Cancers that spread to lymph nodes from other parts of the body are not lymphomas.

Lymphoid tissue is found in many places throughout the body, including lymph nodes, the thymus, the spleen, the tonsils and adenoids, in the bone marrow, and scattered within other systems such as the digestive and respiratory systems.

Myeloma

Multiple myeloma is a type of cancer that affects certain white blood cells called plasma cells.

Plasma cells are part of the immune system, which helps protect the body from infection and disease. Like all white blood cells, plasma cells begin their development in the bone marrow, the soft, spongy tissue that fills the center of most bones.

When cancer involves plasma cells, the body keeps producing more and more of these cells.

Myeloma cells tend to collect in the bone marrow and in the hard, outer part of the bones. In most cases, the myeloma cells collect in various bones, often forming many tumors thus called multiple myeloma.

Question

Which of the following neoplasms seen in dogs, can be cured in 90% or more of cases or more with chemotherapy alone?

- Osteosarcoma
- Transmissible venereal tumor
- Sertoli cell tumor
- Lymphoma

Explanation - The correct answer is transmissible venereal tumor. Complete cure is seen in over 90% of patients treated with vincristine. Cure rates for all of these other tumor types with chemotherapy alone is very low, although remission can certainly be attained in a large percentage of lymphoma cases.

Question

Which of the following drugs and potential side effects are paired correctly together?

- Lomustine - pancreatitis
- Vincristine - cardiac toxicity
- Doxorubicin - cystitis
- L-asparaginase - anaphylaxis

Explanation - L-asparaginase is a protein enzyme and therefore may elicit an immune response. Anaphylaxis is rare but usually would occur only after a patient had received a prior dose and developed antibodies to it.

Vincristine is associated with paralytic ileus.

Lomustine is associated with hepatotoxicity.

Doxorubicin is associated with cardiotoxicity.

Cystitis is associated with cyclophosphamide.

Pancreatitis is associated with L-asparaginase or doxorubicin.

Question

Which of the following drugs is an FDA-approved treatment for a neoplasm in dogs?

- Doxorubicin (Adriamycin)
- CCNU (Lomustine)
- Temozolomide (Temodar)
- Toceranib phosphate (Palladia)

Explanation - In 2009, toceranib (Palladia) became the first FDA-approved veterinary chemotherapeutic for treatment of cancer. Toceranib is an inhibitor of a membrane-bound signaling molecule called a receptor tyrosine kinase (RTK). Many mast cell tumors are known to have mutations in an RTK that contributes to their aggressive behavior and can be blocked by this drug.

Previously, all chemotherapeutics were human-approved drugs used off-label, and this is the case for the other choices listed. Because the approval of this drug was the first of its kind, it has the potential to show up on boards.

Question

The 6-year old 13 kg male cryptorchid Schnauzer in the image below presents for weakness, lethargy, intermittent epistaxis and melena of 1 week's duration. Physical findings include **gynecomastia**, a **pendulous prepuce**, **symmetrical truncal alopecia**, a palpable mid-abdominal mass, pale mucous membranes and a fever of 103.5 F. The dog's hematocrit is 14%, with a total protein of 7.0 g/dl. A blood smear reveals normocytic, normochromic anemia with a

platelet count of 34,000/microliter. The white blood cell count is 2,500/microliter. Which of the following is most likely responsible for this dog's signs?



- Cortisone deficiency
- Testosterone excess
- Thyroid hormone deficiency
- Cortisone excess
- Estrogen excess

Explanation - This dog's presentation should lead you to the presumptive diagnosis of an estrogen secreting tumor; likely a Sertoli cell tumor or seminoma. The dog was described as cryptorchid; dogs with cryptorchidism are prone to testicular tumors. The signs of male feminization such as gynecomastia and the signs of bone marrow suppression are most suggestive of estrogen toxicity.

Question

A 3-month old female Portuguese Water Dog presents to you for immunizations. The dog appears healthy on physical exam with no clinical abnormalities. The owner does not plan to breed the dog, and you advise her that ovariectomy can decrease the risk of certain diseases in the future. When should dogs be spayed in order to get the maximum reduction in the risk of mammary cancer?

Ovariectomy has not been shown to decrease the risk of mammary cancer in dogs

- Before the first estrus
- Before 10 weeks of age
- After 1 full heat cycle
- After at least 2 heat cycles

Explanation - Development of mammary tumors in the dog is hormone-dependent. As such, ovariohysterectomy before a heat cycle prevents the hormonal effects on the mammary glands that predispose them to developing tumors.

Dogs spayed prior to an estrus are 0.05% times as likely to develop a mammary tumor as an intact dog. That risk rises to 8% and 26% after one and two heats respectively with no decrease in risk if they are spayed subsequent to a third heat.

Question

A 9-year old male neutered Rottweiler presents to you with a one-month history of lameness of the right forelimb. The dog is painful on palpation of the proximal humerus. Which is the most likely differential diagnosis to discuss with the owner?



- Osteomyelitis
- Old healed fracture

- Hypertrophic osteopathy
- Primary bone tumor

Explanation - The signalment of a large breed, older dog, and a radiographically aggressive bone lesion in the proximal humerus are most suggestive of primary bone neoplasia. The destructive element of the lesion indicates its aggression, and the location in one bone, in a site of predisposition for cancer, make fungal osteomyelitis less likely.

Question

What tumor type is most frequently implicated in causing feminization syndrome in dogs including gynecomastia, sexual attraction of males, and bilaterally symmetric alopecia?

- Seminoma
- Sertoli cell tumor
- Mammary carcinoma
- Leydig cell tumor

Explanation - The correct answer is Sertoli cell tumors. The tumor sometimes secretes estrogen and other hormones, which can lead to this syndrome.

Question

A 10-year old Shih Tzu presents for collapse. A diagnostic work up shows a mass on the right kidney, which was subsequently removed and biopsied as renal carcinoma. Which one of the following can be associated with renal carcinoma?

- Polycythemia
- Hyperadrenocorticism
- Hypercalcemia
- Hyperestrogenism

Explanation - Renal carcinomas have been associated with erythropoietin secretion, causing elevations in hematocrit as a paraneoplastic syndrome.

Hypercalcemia is associated with anal sac adenocarcinomas, lymphomas, multiple myeloma and other tumors.

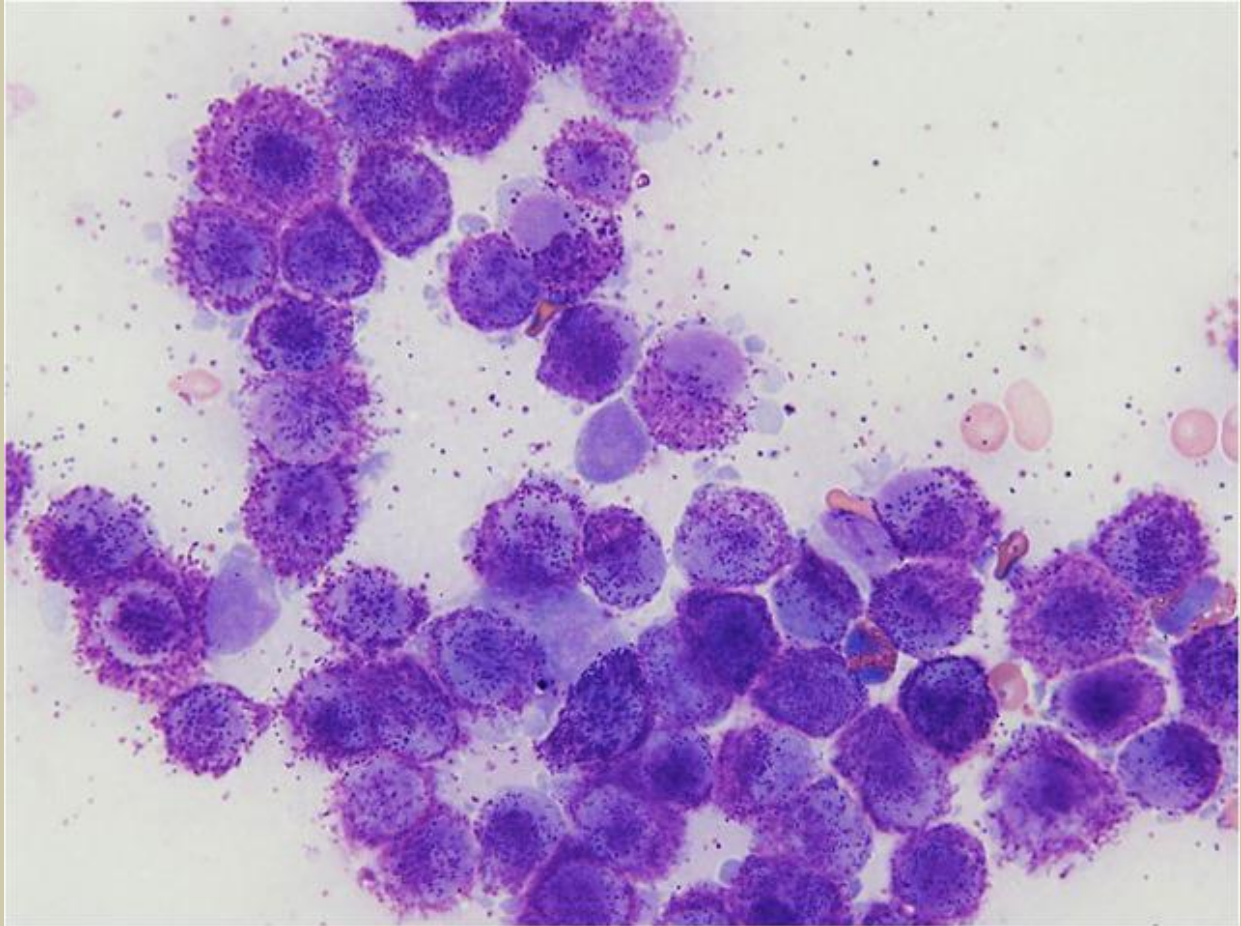
Thrombocytopenia can be seen with hemangiosarcoma and multiple myeloma.

Hyperestrogenism can be seen with Sertoli cell tumors.

Hyperadrenocorticism is caused by functional adrenal or pituitary tumors.

Question

An 8-year old male neutered boxer presents for a mass on his left forelimb of 3 months duration. The owner has noticed that the mass seems to change in size, but does not seem to bother the dog at all. There has not been any limping, hair loss, or pruritis seen with the mass. Fine needle shows these cells (see image). In house thoracic and abdominal radiographs are unremarkable. CBC/Chem/T4 are normal. Fine needle aspirate of the left suprascapular lymph node shows normal lymphoid tissue with minimal reactivity. What do you tell the owner regarding prognosis?



- Prognosis is fair. Surgery is required, radiation may be necessary after.
- Prognosis is poor. Surgery and radiation will prolong quality of life.
- Prognosis is dependent upon grade. Surgical excision with wide margins is needed.
- Prognosis is very good. Will likely cure with surgery.

Explanation - Mast Cell Tumors have a 3 grades:

Grade 1-least likely to metastasize. Well differentiated and superficial. Usually curative with surgical excision.

Grade 2- well to good differentiation. SQ involvement. Prognosis is varied and dependent upon cell surface markers, signs of metastasis, and local reoccurrence. Can be cured with surgery.

Grade 3- Poorly differentiated. Poor prognosis with likelihood of metastasis, reoccurrence. Aggressive treatment needed.

In order to determine prognosis it is ideal to fully stage the animal with local lymph node aspiration, metastasis check in the abdomen and thorax, blood work, and grade of the tumor itself. More recently, it has been discovered that the amount of mitotic figures identified per high per field correlates greatly with how aggressive the tumor will behave.

Bloodwork and met check in this boxer were unremarkable. The mass was removed with wide margins of 3cm and one fascial plane deep which is currently recommended. The tumor was graded at a low 2; 2 years post-surgery there has been no reoccurrence of the mass and regional lymph nodes have been clean; likelihood of curative surgery is high for this boxer.

Question

As shown in the photo below, cardiac hemangiosarcoma in dogs is most commonly found on what area of the heart?



- Left atrium
- Left ventricle
- Right atrium
- Right ventricle

Explanation - The correct answer is right atrium. Although the reason for this predilection is unknown, this is the most common site in the heart for hemangiosarcoma to occur.

Question

A 6-year old male neutered Weimaraner presents for left forelimb lameness. Radiographs are shown below and show a mixed productive and destructive lesion affecting the left distal radius with accompanying soft tissue swelling. The lesion does not cross the joint. What is the most common primary bone tumor in the dog?



- Osteosarcoma
- Chondrosarcoma
- Fibrosarcoma
- Multiple myeloma
- Hemangiosarcoma

Explanation - The correct answer is osteosarcoma. Chondrosarcoma, fibrosarcoma and hemangiosarcoma can all be primary bone tumors but are much less common in dogs than osteosarcoma.

Question

What is the most common tumor in dogs that causes the clinical sign shown in the photograph?



- Nasal lymphoma
- Splenic hemangiosarcoma
- Nasal adenocarcinoma
- Pulmonary adenocarcinoma

Explanation - The correct answer is nasal adenocarcinoma. Nasal lymphoma is rare in dogs but is the most common intranasal tumor in cats.

Splenic hemangiosarcoma is common in dogs but typically results in signs of hemoabdomen. Pulmonary adenocarcinoma is not uncommon but is unlikely to result in epistaxis, as cough or no clinical signs at all are much more typical.

Question

A 13-year old female Dachshund presents for 2 lumps on her abdomen. Your physical exam reveals that both lumps are 2.5 cm mammary masses in the 5th mammary gland. The associated inguinal lymph node is prominent. Aspirates of the lymph node show sheets of epithelial cells on cytology. Both mammary masses are firm and nodular in shape. Which of the following is true?

- Mammary tumors in the 5th gland is a negative prognostic indicator
- The lymph node aspirate results are a negative prognostic indicator
- The size of each mass is a negative prognostic indicator
- The firmness and nodularity of the masses is a negative prognostic indicator
- Having 2 mammary masses is a negative prognostic indicator

Explanation - You should never find sheets of epithelial cells in a lymph node unless it is infiltrated with metastasis (or unless you aspirated something else on accident, like a salivary

gland). Metastasis of mammary gland tumors in dogs is a negative prognostic indicator, whereas none of the other choices above are thought to directly influence prognosis.

Question

What type of tumor in the dog is commonly associated with signs of local inflammation as shown in the image?



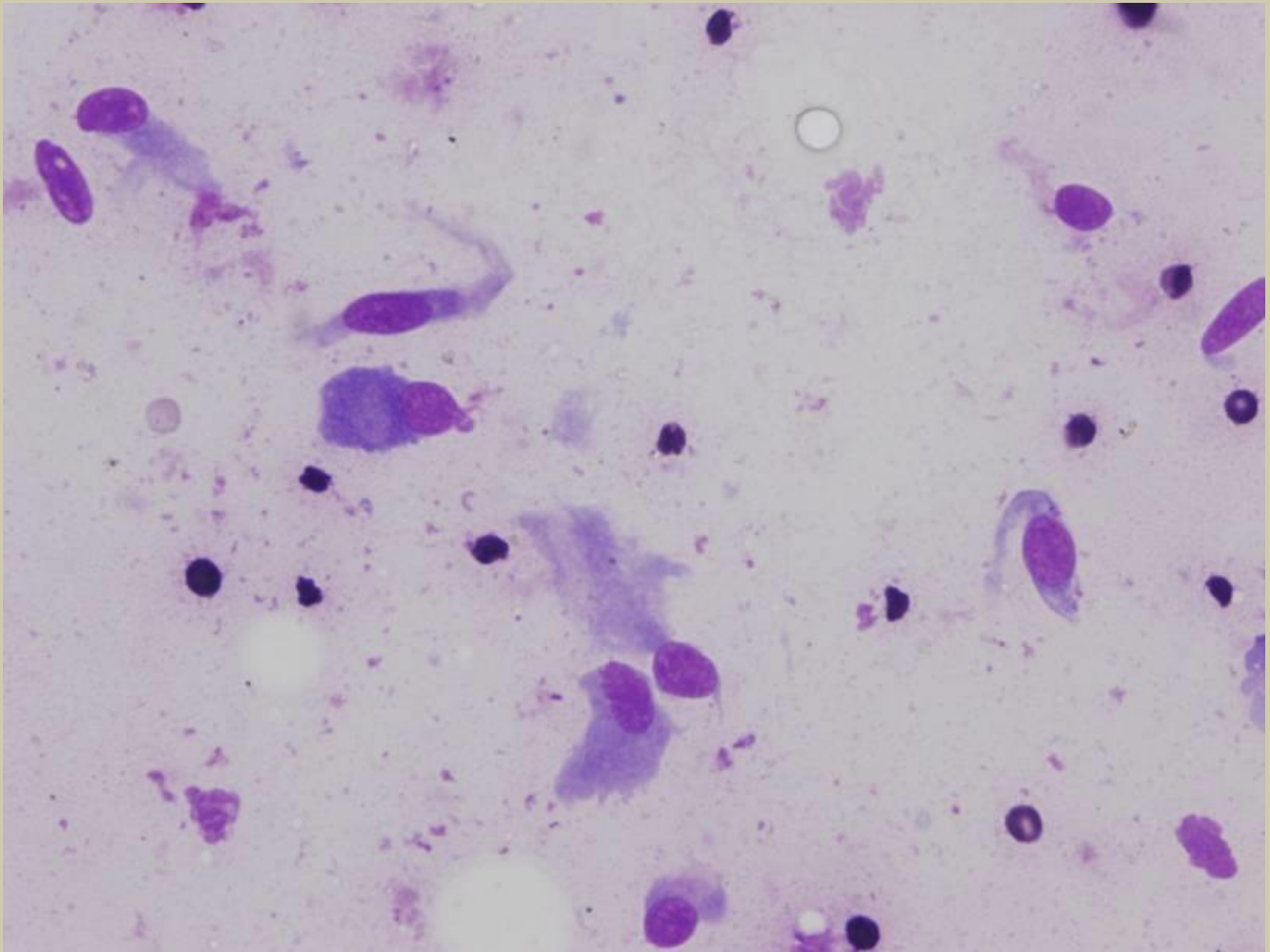
- Lymphoma
- Cutaneous melanoma
- Mast cell tumor
- Mammary carcinoma

Explanation - The correct answer is mast cell tumor. Mast cells contain granules with inflammatory mediators including heparin and histamine and commonly cause local inflammation. They can also cause paraneoplastic signs associated with hyperhistaminemia and hyperheparinemia. Half of mammary tumors in dogs are benign and half are malignant. Even the malignant ones do not usually have associated inflammation with the noteworthy exception of a relatively rare type of tumor called an inflammatory mammary carcinoma that carries a very poor

prognosis. Hemangiosarcoma and lymphoma are both malignant tumors but are not usually associated with extensive inflammation. Cutaneous melanoma in the dog is benign in 80-90% of cases in contrast to humans.

Question

The image below is from an aspirate taken from a lytic bone lesion seen on radiographs of a nine year old female Vizsla dog. Choose the correct cell type of origin AND classification.



- Mesenchymal origin; sarcoma
- Epithelial origin; sarcoma
- Epithelial origin; carcinoma
- Leukocyte origin; round cell tumor
- Mesenchymal origin; carcinoma

Explanation - This is an osteosarcoma. The classification scheme for tumors by cell of origin and cytologic description is:

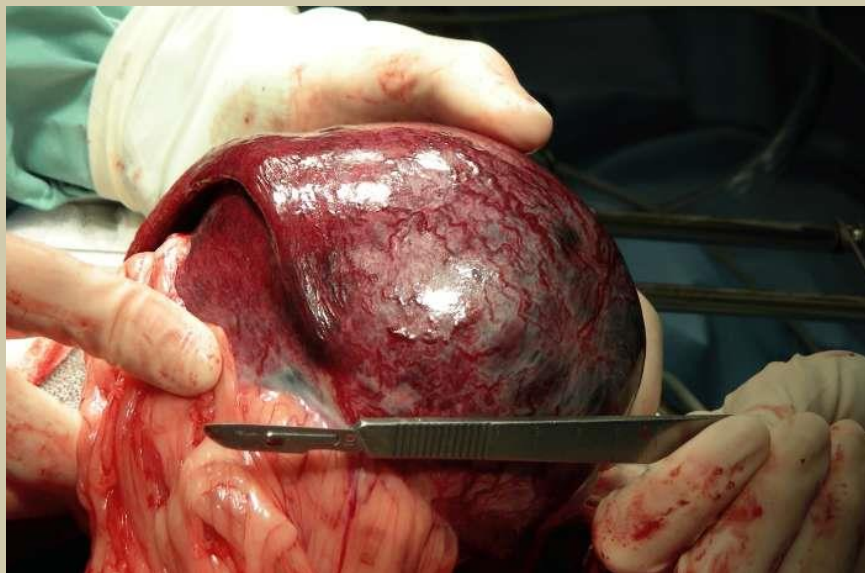
Sarcoma- These tumors come from mesenchymal cells and are named by the specific cell type such as fibroblasts (fibrosarcoma) and osteoblasts (osteosarcoma). Cytologically, they tend to appear as isolated spindle-shaped cells with elongated cytoplasm and often oval nuclei. Those are the features you should have identified in the image. If you identified several cells that have pink areas in the cytoplasm which likely represent osteoid, well done!

Carcinoma- These tumors come from epithelial cells including cells of glandular tissues such as salivary glands, mammary glands, and cells lining most tissues including squamous cells or transitional cells. The cytologic appearance is that of cohesive clusters of cells. Cells are often polygonal in shape.

Round cell tumors- There are 5 round cell tumors and most but not all come from blood cells. They are lymphoma, mast cell tumors, plasma cell tumors, histiocytic tumors, and transmissible venereal tumors. Remember, these are sometimes also referred to as sarcomas (i.e. lymphosarcoma or histiocytic sarcoma). Cytologically, they appear usually as large populations of cells that are not in defined clusters. The cells have a round shape, often with unique identifiable features such as the purple granules in mast cell tumors.

Question

A 9-year old female spayed German Shepherd presented for extreme lethargy. Physical examination and diagnostics were consistent with a **hemoabdomen**. The patient was taken to surgery and a splenic mass was found (see image). The remainder of your abdominal exploration was unremarkable. What is the most common malignant tumor of the spleen in the dog?



- Lymphoma
- Transitional cell carcinoma
- Hemangiosarcoma
- Mast cell tumor

Explanation - The correct answer is hemangiosarcoma. This tumor accounts for approximately 2/3 of malignant splenic masses and will have metastasized in >90% of cases by the time they are diagnosed. Chemotherapy would be recommended for adjunct therapy after surgical removal of the spleen. Lymphoma is not as commonly found in the spleen in dogs, and you would have expected enlarged lymph nodes to be mentioned in the question. Mast cell tumors occur with some frequency in the spleen of cats but not so often in dogs. Transitional cell carcinomas are typically found in the urinary bladder, since that is where transitional cells are located.

Question

Which of these is a radiographic characteristic of an aggressive bone lesion?

- Indistinct lesion margins
- Homogenous periosteal reaction
- Organized trabecular bone
- Sharp lesion margins

Explanation - The correct answer is indistinct lesion margins. The radiographic characteristics of an aggressive bone lesion are poorly-defined transition zones between normal and abnormal bone, moth-eaten appearance to the bone, and active periosteal reaction, especially heterogeneous reaction. The other answer choices in this question are characteristics of nonaggressive bone lesions.

Question

Which of the following statements about mammary tumors is true?

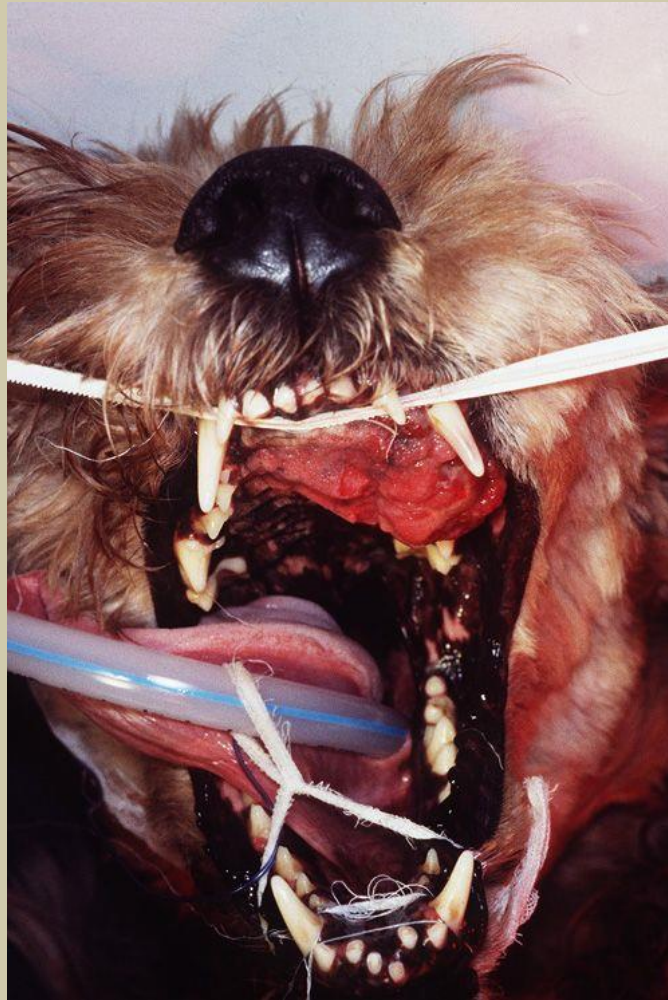
- A 4 cm mammary carcinoma in a dog carries a better prognosis than a 2 cm mammary adenoma in a cat
- A cat with a 3 cm mammary carcinoma has a good long term prognosis with surgery and chemotherapy
- Dogs with malignant mammary tumors greater than 3 cm in size are considered to have a worse prognosis than those with tumors 2 cm in size
- Development of mammary tumors in cats is not influenced by hormone levels through a cat's life
- Most mammary tumors in dogs occur in the 1st or 2nd glands

Explanation - Generally, dogs with malignant mammary tumors greater than 3 cm are thought to have a worse prognosis than those with tumors smaller than 3 cm. The tumor size cut off in cats is 2 cm; cats with mammary tumors greater than 2 cm have a poorer prognosis than those with tumors smaller than 2 cm. Mammary tumors more frequently develop in the caudal glands (4th and 5th). Like in dogs, the risk for development of mammary tumors in cats is greatly reduced if

they are spayed early in life; there is a strong hormonal influence associated with development of mammary tumors later in life.

Question

What is the most common tumor of the oral cavity in the dog, as seen in the photo?

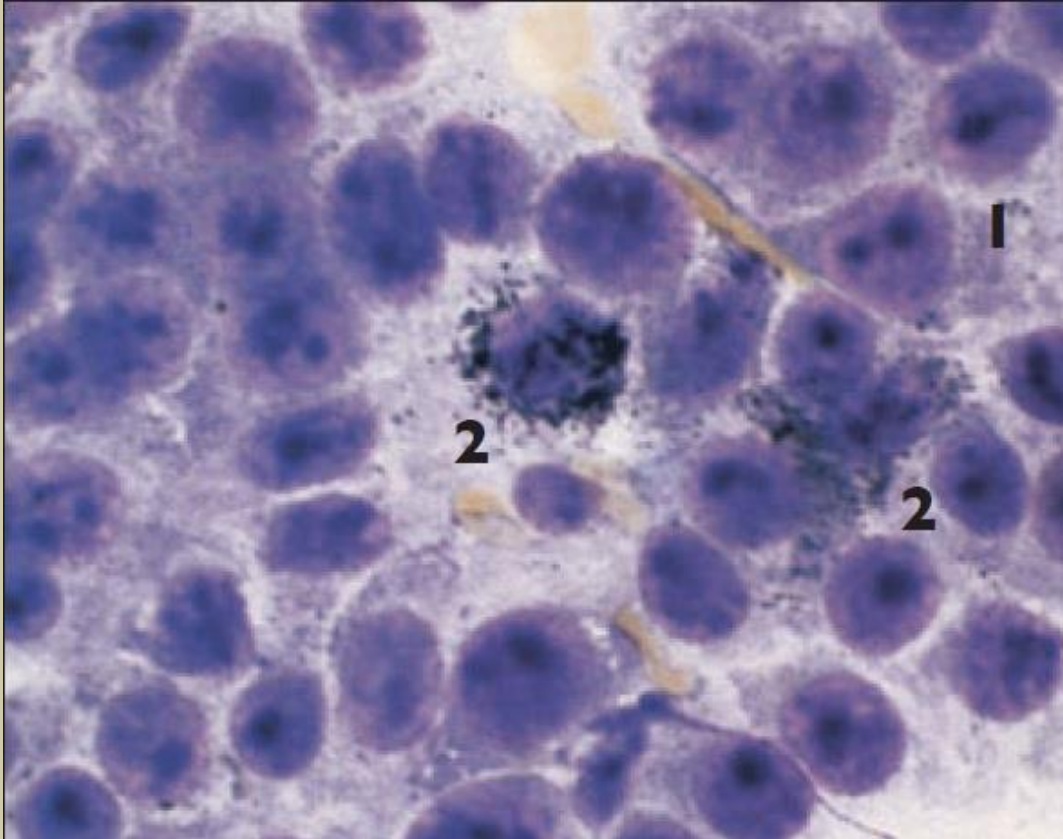


- Acanthomatous epulis
- Melanoma
- Lymphoma
- Fibrosarcoma

Explanation - The correct answer is melanoma. Melanoma comprises about 1/3 of all oral tumors in dogs. Many oral melanomas may be amelanotic, as the one in the photograph appears to be. The second most common tumor is squamous cell carcinoma followed by fibrosarcoma and acanthomatous epulis.

Question

A 10-year old female German Shepherd presents to you with a mass on the 3rd digit of the left hind foot that has been present for 3 weeks and growing. On physical exam, the mass is dark red and the skin is hairless. You perform a fine needle aspirate and evaluate it cytologically. A representative field from the aspirate is shown in the image below. What is the most likely diagnosis?



- Lymphoma
- Melanoma
- Squamous cell carcinoma
- Mast cell tumor

Explanation - The cytology shows cells with large nuclei, stippled chromatin with prominent and sometimes multiple nucleoli (labeled with 1). A few cells (labeled with a 2) have dark green/black melanin granules.

Melanoma is an important differential for a nail bed tumor. At this site, they are frequently malignant and the local lymph node should be palpated and aspirated. Additional staging (thoracic radiographs and abdominal ultrasound) should also be considered. If there is no evidence of metastasis, the affected digit should be amputated.

Question

What is the most appropriate medical treatment for transitional cell carcinoma at the trigone of the bladder, as depicted in the photo?



- Piroxicam and platinum chemotherapy
- Clavamox and furosemide
- Prednisone and combination chemotherapy with cyclophosphamide, vincristine, doxorubicin
- Carprofen and combination chemotherapy with cyclophosphamide, vincristine, doxorubicin
- Prednisone and vinblastine or lomustine chemotherapy

Explanation – The correct answer is piroxicam and platinum chemotherapy. Transitional cell carcinoma of the bladder in dogs can be palliatively managed with non-steroidal anti-inflammatory drugs such as piroxicam. Progression-free interval and survival can be extended with the addition of chemotherapy. The most commonly used agents are carboplatin, cisplatin, and mitoxantrone. Secondary infections can be treated with appropriate antibiotics.

Question

A 2-year old Terrier mix presents for an alopecic, raised nodule on its head. The owner describes previous similar lesions that have ulcerated and regressed over time. What is your most likely diagnosis?

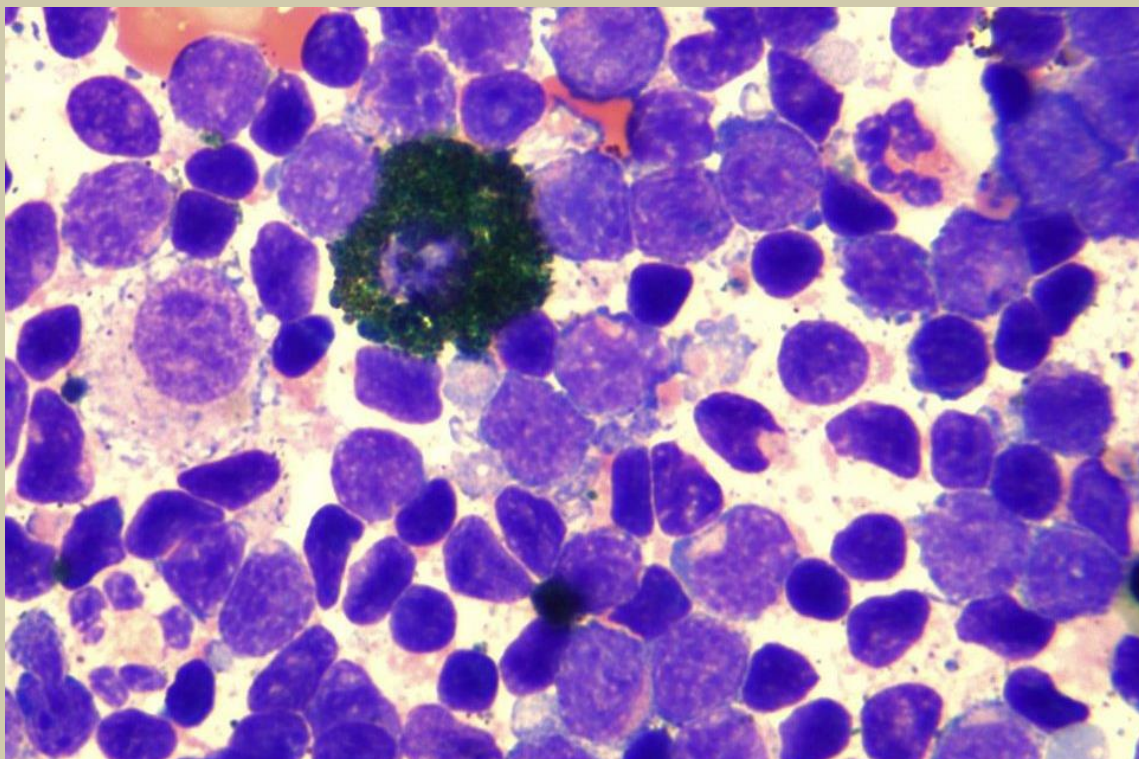
- Hemangiopericytoma
- Cutaneous histiocytoma
- Melanoma
- Mast cell tumor
- Cutaneous hemangiosarcoma

Explanation - The correct answer is cutaneous histiocytoma. Cutaneous histiocytomas in dogs occurs early in life at less than 3 years of age. The lesions are alopecic, raised, nodules that often ulcerate and regress on their own. Treatment is not needed unless the lesions persist. Treatment for persistent lesions is surgery. The other tumor types do not regress, although mast cell tumors may grow and shrink over time.



Question

An 8-year old female Chow Chow presents to you for difficulty eating. On oral exam, you see a 3 cm mass in the caudal maxilla. You are unable to obtain a fine needle aspirate because of the mass's location but you detect an enlarged mandibular lymph node and aspirate it. A representative field from the aspirate is shown in the image below. In addition to surgery (+/- radiation), which of the following is an APPROVED treatment option for this disease that you would mention to the owner?



- Palladia
- Mitoxantrone
- Vincristine
- Doxorubicin
- ONCEPT vaccine

Explanation - The image shows a lymph node with metastatic melanoma (the large cell with black melanin pigment). The ONCEPT vaccine, also commonly referred to as the "melanoma vaccine" was given a conditional product license in 2007 and was USDA approved in 2010 as a therapeutic vaccine for cancer treatment.

Palladia is a receptor tyrosine kinase inhibitor approved for use in mast cell tumors in dogs. Doxorubicin, vincristine and mitoxantrone are human chemotherapy drugs commonly used off-label in veterinary oncology but not routinely for melanoma.

Question

A 2-year old mixed breed dog presents for a mass on her upper lip that the owners noticed three weeks ago (see image). It has not grown in size, and does not seem to bother the dog. On physical exam the dog is bright, alert, and responsive with no other significant findings aside from the mass. The mass is smooth, less than 1cm in diameter, and localized to the skin. How would you recommend confirming your tentative diagnosis, and what do you tell owner regarding prognosis?

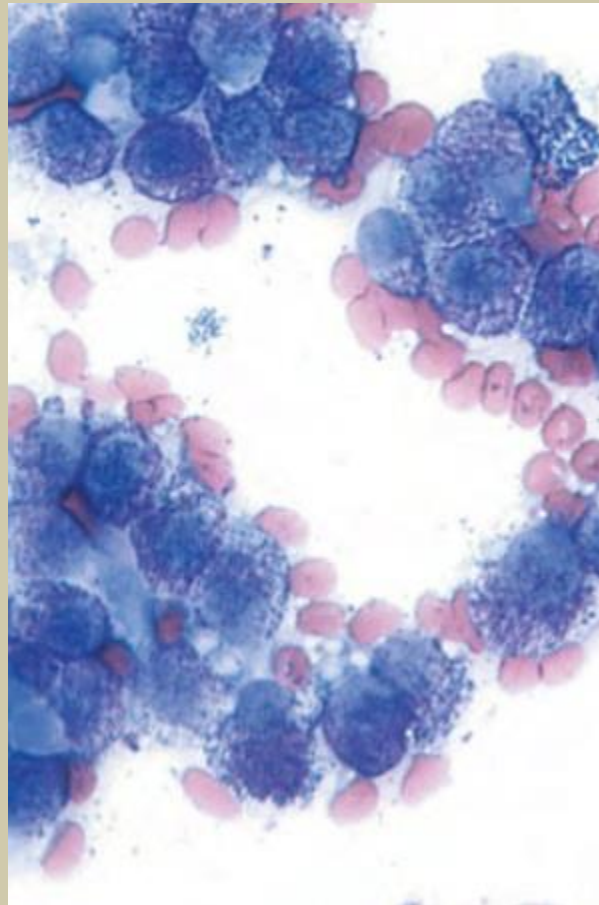


- Fine needle aspirate, prognosis likely good
- Monitor, prognosis likely guarded
- Surgical excision, cannot give prognosis without histopathology
- Biopsy, prognosis likely fair

Explanation – The correct answer is Fine needle aspirate, prognosis likely good. In young dogs small localized masses along the head, ears, and limbs are often histiocytomas, a benign collection of histiocytes with a few other inflammatory cells present. They can occur in younger dogs and often resolve after a few months. A few histiocytomas can ulcerate, and multiple histiocytomas can be found on one animal. Those that do not regress on their own can be surgically excised. Differentials should include mast cell tumors, which need grading and staging to determine prognosis, sebaceous adenomas, papillomas, and infection. Fine needle aspirates will often give a conclusive diagnosis.

Question

A 6 year old male neutered pit bull presents for multiple lumps that appeared over a course of a week. Fine needle aspirates of several of the lumps showed what is in the picture below. Which of the following medications should be prescribed to this dog?



- H2 blocker
- Anti-emetics
- Beta blocker
- Sedatives
- Antibiotics

Explanation - The cells in the picture are mast cells. They are characterized by a single round nucleus with dark purple staining granules in the cytoplasm. This dog has multiple mast cell tumors that grew rapidly over the course of a week. H1 blockers (diphenhydramine) and H2 blockers (famotidine, cimetidine, ranitidine, etc) are commonly prescribed as supportive care for dogs with gross mast cell disease due to the histamine release by the mast cells. This histamine release causes increased gastric acid secretion, predisposing to gastric ulceration and GI bleeding. Surgical removal is the definitive therapy for mast cell tumors.

Question

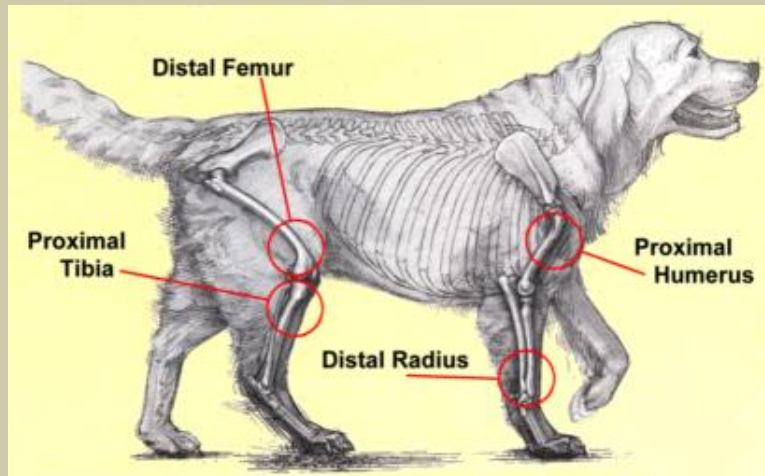
An 8-year old, retired, racetrack Greyhound presented for lameness of the right forelimb. Radiographs showed a mixed proliferative and lytic lesion in the region of the proximal humerus. Blood work showed a HCT=54, TP=5.9 mg/dl, ALP=568 U/L, ALT=42 U/L, T. Bili 0.5 mg/dl, creatinine=0.9 mg/dl, and BUN=49 mg/dl. Three view chest radiographs show no lung or heart pathology. What recommendations will you make to the owners?

- Right forelimb amputation followed by chemotherapy
- Coccidioidomycosis was likely acquired at the racetrack and this dog should be started on anti-fungal therapy immediately
- Definitive radiation therapy will need to be instituted for the next 6 weeks
- No treatment is recommended since the blood work is suggestive of metastasis making the prognosis grave

Explanation - Greyhounds are one of the most predisposed breeds to osteosarcoma. Any geriatric greyhound with a lameness should be evaluated promptly for this reason. Unless the patient has a highly suspicious history of living in, or being exposed to, areas with high levels of fungal organisms, the radiographic findings are almost confirmatory for osteosarcoma. Regardless of a strong suspicion, core biopsies (shown on the image) or a needle aspirate of the lesion should be obtained prior to a definitive treatment.

The appropriate treatment in dogs without radiographic evidence of metastasis is amputation followed by chemotherapy. Amputation alone will provide a 2-3 month survival period. While amputation with chemotherapy yields a 9-12 month survival period. Definitive radiation therapy is not possible for these tumors. However, radiation therapy is great when using it as a palliative mode of therapy.

The only feature of the blood work which is of note is the ALP. Studies have shown that an elevated ALP is associated with a more aggressive tumor. Aside from informing the owners of this potential, it is still recommended to proceed with amputation and chemotherapy. In these situations, some surgeons and oncologists may recommend performing a CT of the chest to evaluate the chest for metastasis more thoroughly prior to proceeding with surgery and chemotherapy.



Usual sites for osteosarcoma development

Question

A 12-year old English Bulldog presents with anorexia and severe, generalized pain. What is the best description of the lesions in this radiograph?



- Monostotic, non-aggressive
- Monostotic, aggressive

- Polyostotic, non-aggressive
- Polyostotic, aggressive

Explanation - There are multiple lytic lesions in the cervical and thoracic vertebrae, especially visible in C2 and in the spinous processes of the T1-T8. There are also lytic lesions in the proximal humerus of one leg and in the bones of the skull.

Question

A 10 year old female spayed German shepherd dog presents for collapse and difficulty breathing. Your physical exam shows pale mucous membranes, a fluid wave in the abdomen and a splenic mass. Aspiration of the abdominal fluid shows hemorrhagic effusion that does not clot. Which of the following is commonly found with your presumed diagnosis?

- Factor VIII deficiency
- Hypercalcemia
- Disseminated intravascular coagulation
- Von Willebrand's disease

Explanation - The presumed diagnosis based on the given signalment, physical findings, and diagnostics is splenic hemangiosarcoma, which is often associated with DIC.

Question

Which of these tumor types is frequently testosterone-dependent and is therefore found most frequently in dogs that are intact males or have testosterone-secreting tumors?

- Perianal adenoma
- Squamous cell carcinoma
- Apocrine gland anal sac adenocarcinoma
- Mast cell tumors

Explanation - The correct answer is perianal adenoma. These tumors are primarily seen in older male intact dogs. These tumors will often shrink or resolve after castration.

Question

This radiograph is of a 10-year old male castrated mixed-breed dog that has been progressively more lame on the left forelimb over the past 3 weeks. Owners report that he has always been healthy and still has a great appetite. There is a travel history of visiting Nevada approximately 8 months ago. What is the recommendation for this patient?



- Strongly recommend performing a total elbow replacement given the severe degree of osteoarthritic changes
- Strongly recommend initiating glucosamine and chondroitin therapy as well as NSAIDs
- Strongly recommend chest radiographs and a biopsy prior to initiating treatment
- Strongly recommend a CBC and chemistry panel and then initiate anti-fungal therapy for a minimum of six months

Explanation - Strongly recommend chest radiographs and a biopsy prior to initiating treatment. This radiograph has a component of lytic and proliferative lesions that cross the joint. The differentials include neoplasia, fungal osteomyelitis, or bacterial osteomyelitis. Since the bony involvement is crossing the joint, it is **most likely a synovial cell sarcoma**. Osteosarcoma, fibrosarcoma, and chondrosarcomas are less likely to cross a joint as seen in this image. The marked lytic component seen should eliminate severe osteoarthritis as a differential. Anti-fungal therapy or any definitive treatment should ideally not be initiated until a diagnosis is obtained.

Question

A 12 year-old female spayed mixed breed dog presents for further evaluation of intermittent vomiting of 2 weeks duration. A general physical exam was performed and found to be unremarkable. Blood work was performed and the following abnormalities were observed: CK 1019 IU/L, AST 106 U/L, ALK Phos 864 U/L, ALT 340 U/L. An abdominal ultrasound was performed and revealed a massive, multilobular, heterogenous mass associated with the right medial liver lobe. The remaining liver lobes appeared to be unaffected. Based on the history, blood work, and findings what is the likely long-term survival of this patient if surgery is pursued and a hepatocellular carcinoma is diagnosed?



- Approximately 700 days
- Approximately 28 days
- Approximately 300 days
- Approximately 1400 days

Explanation - Single solitary liver masses are generally considered a surgical disease as long there is no overt evidence of metastasis or concern that the mass is a metastatic lesion as opposed to a primary tumor arising from the liver. Primary liver masses include hepatomas, hepatocellular carcinomas, bile duct adenomas, bile duct carcinomas, and rarely, neuroendocrine tumors. Hepatocellular carcinomas are the most common liver tumor of dogs and second most common in cats. Adenomas will have a better prognosis, however hepatocellular carcinomas generally carry a good prognosis after surgical excision as well.

Bile duct carcinomas have a much more guarded prognosis with an average survival time of approximately 6 months. The prognosis for neuroendocrine tumors of the liver is poor.

Question

A 12-year old pit bull mix presents for limping on the left hind leg off and on for a 3-month duration. The dog has never traveled out of Washington, and is on flea and tick preventative. The dog is current on vaccines and heartworm preventative. On physical exam, the dog resists flexion and extension of the left limb and cries and attempts to bite when the leg is palpated. No abnormalities are palpated. A III-IV/IV lameness is noted when the dog walks. CBC shows a moderate leukocytosis with neutrophilia and monocytopenia. The chemistry panel is unremarkable. T4 and UA are pending. The rest of the physical exam is unremarkable. Based on the radiographic results (see image) what is the most appropriate next step?



- Thoracic radiographs and fungal serology
- Hind limb amputation
- Anti-inflammatories and rest
- Antibiotics and steroids

Explanation - Osteolytic lesions along the distal femur are highly suspicious of **osteosarcoma** (OSA). Given the age and clinical history it should be your first differential. The other differential would be fungal disease such as **coccidioidomycosis** (Valley Fever). This fungal infection is seen predominantly in the southwestern United States, but should not be excluded without full testing. The appropriate next step to differentiate OSA from Valley Fever would be thoracic radiographs to look for metastases and fungal serology to determine exposure and antibody levels to fungal diseases. Chest films are available for review below which show metastatic disease. Of note, coccidioidomycosis can also affect the lungs, leading to an interstitial, bronchiolar, multifocal, or alveolar pattern as well.

Gold standards for diagnosis of OSA are biopsy of the affected boney lesion. Remember OSA should not cross the joint. Elevations in alkaline phosphatase and/or gross visible metastatic lesions give a worse prognosis with shorter longevity, even with aggressive treatments.



Question

A 5-year old intact male mixed breed dog presents for a mass on his penis noticed by the owner. The dog has a history of being adopted from the streets of Mexico and is otherwise acting healthy at home. Fine needle aspirate of the mass shows a large number of round cells with vacuoles in the cytoplasm. What is the treatment of choice for this problem?

- Piroxicam
- Lomustine
- Cyclophosphamide
- Prednisone
- Vincristine

Explanation - The mass described is classic for transmissible venereal tumor (TVT) in dogs. TVT is a sexually transmitted tumor found throughout the world, particularly in areas with high populations of stray dogs. The tumor cells are transferred from one dog to the next by physical contact, which typically consists of sniffing, licking, and copulation. The tumor is often curable with **vincristine** chemotherapy.

Question

Which of these signs are least compatible with an estrogen secreting Sertoli cell tumor in a dog?

- Truncal alopecia
- Polyuria and polydipsia
- Cryptorchidism
- Gynecomastia
- Aplastic anemia

Explanation - The answer is polyuria and polydipsia. Estrogen secreting Sertoli cell tumors are quite common in cryptorchid testes and cause the clinical signs of truncal alopecia, hyperpigmentation, gynecomastia, urinating in a female position, and bone marrow dyscrasias such as aplastic anemia. Attraction of other males can also occur. PU/PD is a sign commonly seen with endocrinopathies but not this one.

Question

Which of these chemotherapeutic drugs causes irreversible tissue sloughing if the drug is perivascularized or given any route other than IV to a dog?

- Cisplatin
- Mitoxantrone
- L-Asparaginase
- Doxorubicin

Explanation - The correct answer is **doxorubicin**. Perivascularization of this drug causes a severe irreversible tissue slough that may require amputation. Some other chemotherapy drugs such as vincristine cause a more localized severe reaction if perivascularized. L-Asparaginase can be safely given subcutaneously or intramuscularly. Cisplatin can be given intralesionally. Carboplatin is always given IV but if perivascularized, does not cause a severe reaction.

Question

A 10-year old female spayed boxer presented for a mass on the left side of the neck. The mass was diagnosed as a **mast cell tumor** based on fine needle aspirate. Screening with thoracic radiographs, abdominal ultrasound and bloodwork was unremarkable. The owners elected for surgical removal and clean 3 cm margins were obtained in all directions. The mass was submitted for histopathology and was categorized as a grade 3 (or high grade) tumor. What is your recommendation to the owner?

- Start a doxorubicin based chemotherapy protocol.
- Radiation therapy for the surgical site and prescapular lymph node; abdominal ultrasounds every 3-4 months.
- Monitor the surgical site for recurrence; abdominal ultrasounds every 3-4 months.
- Start a tyrosine kinase inhibitor chemotherapy drug.

Explanation – The correct answer is Start a tyrosine kinase inhibitor chemotherapy drug. Under the Patnaik grading system, grade 3 tumors are highly metastatic. Mast cell tumors are highly responsive to radiation therapy, but with clean excision and wide surgical margins, local recurrence is unlikely. Metastasis is the primary concern and a wait and monitor approach is not advised. Even with no evidence of metastasis at the time of surgery, chemotherapy should be initiated as soon as possible. Common protocols include single agent or alternating vinblastine and lomustine. Tyrosine kinase inhibitors, such as toceranib (Palladia) and masitinib (Kinavet), target c-kit, a stem cell factor receptor involved in mast cell proliferation and differentiation. Palladia and Kinavet are FDA approved for treatment of high-grade canine cutaneous mast cell tumors.

Question

A 10-year old female spayed Golden retriever presents for evaluation of tenesmus. On rectal palpation, you feel a golf ball sized firm mass in the 8 o'clock region. Bloodwork and thoracic radiographs were unremarkable. What next two steps would you recommend to the owner?

- Fine needle aspiration of the mass and abdominal ultrasound
- Surgical excision of the mass and radiation therapy
- Fine needle aspiration of the mass and surgical excision
- Start a laxative and antibiotic therapy

Explanation – The correct answer is Fine needle aspiration of the mass and abdominal ultrasound. A mass in the 4 o'clock or 8 o'clock regions is most consistent with an anal sac tumor, which is

most commonly apocrine gland adenocarcinomas; however, a fine needle aspirate or biopsy is needed for a definitive diagnosis. Hypercalcemia is occasionally associated with this tumor type and dogs commonly present for tenesmus or licking around the perianal region.

The sublumbar lymph nodes are the most common site for metastasis so abdominal ultrasound prior to excision of the mass is recommended to determine the extent of the disease. Depending on the size of the mass, surgical removal should be recommended along with surgical removal of the sublumbar lymph nodes if they are enlarged. Radiation therapy of the anal sac region along with the lymph nodes (if not excised) may also be recommended to slow or prevent tumor recurrence. Chemotherapy has been used in conjunction with other therapies but results are variable.

Question

Which of the following is most likely to cause the abnormality seen in this radiograph?

- Osteosarcoma
- Aspiration pneumonia
- Penetrating thoracic trauma
- Blastomycosis
- Pyometra



Explanation - The correct answer is osteosarcoma. The abnormality in the radiograph is multiple pulmonary nodules consistent with metastatic neoplasia. Systemic fungal disease would be a reasonable differential for this radiographic pattern but is not as good of a choice, especially with no evidence of hilar lymphadenopathy. Aspiration pneumonia would cause an alveolar infiltrate centered in the cranioventral lung region, and penetrating trauma would likely cause pneumothorax. There is no evidence of pneumothorax in this study.

Question

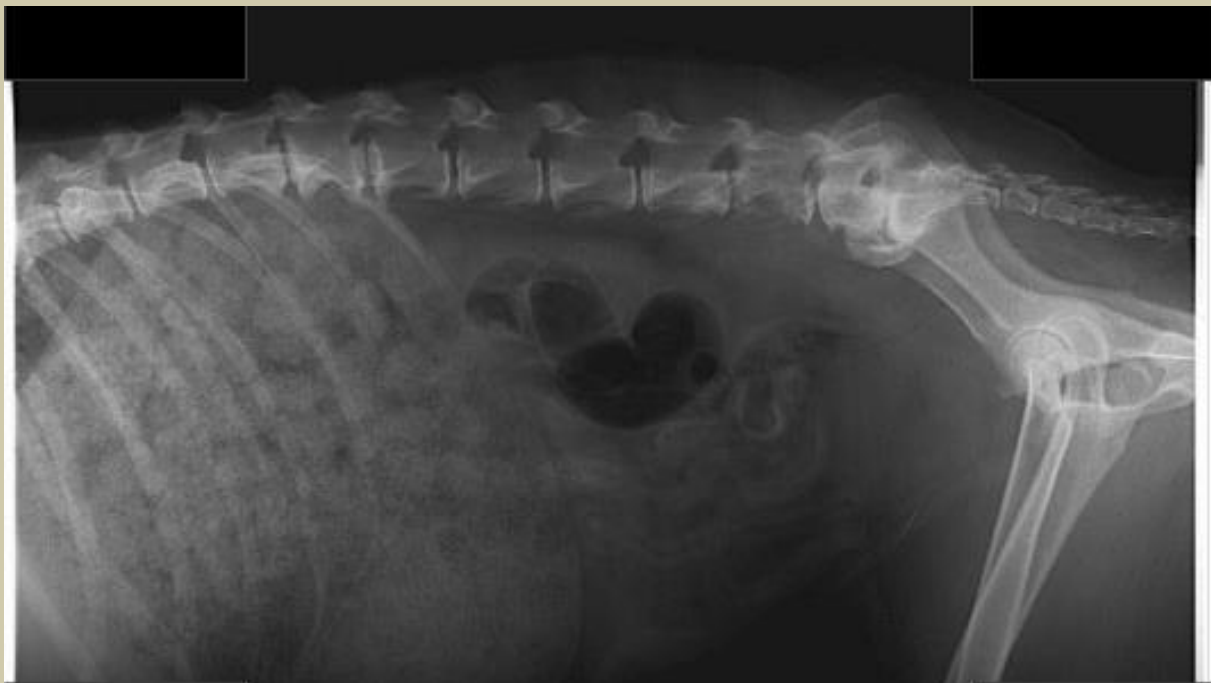
Which of these biochemical profiles are most consistent with the diagnosis of insulinoma in a dog?

- Blood glucose=150 mg/dl, Serum insulin-low
- Blood glucose=150 mg/dl, Serum insulin-high
- Blood glucose=45 mg/dl, Serum insulin-high
- Blood glucose=45 mg/dl, Serum insulin-low

Explanation - The correct answer is blood glucose-45 mg/dl, serum insulin-high. An insulinoma can result in an animal having normal to high insulin levels in the face of low blood glucose levels because the normal controls of insulin secretion are lost.

Question

You are examining an 8-year old Shepherd mix who presents for lethargy. Bloodwork shows no significant abnormalities. You take abdominal radiographs, the lateral projection is shown below. Which of the following is most likely to cause the abnormality or abnormalities seen in this radiograph?



- Hepatic neoplasia
- Prostatic neoplasia
- Intervertebral disc disease
- Immune mediated polyarthritis
- Discospondylitis

Explanation - The abnormalities you should have identified in this radiograph are a sublumbar mass and bony lysis of the L6 vertebral body. This extent of bony lysis is not seen with intervertebral disc disease, spondylitis, or immune-mediated polyarthritis. It is most frequently a sign of bony neoplasia, usually either bony metastasis or bony invasion of sublumbar lymph node metastasis. Hepatic neoplasia does not typically invade vertebral bones or metastasize to the sublumbar lymph node but prostatic neoplasia does.

Question

A 9 year old Greyhound presents to your clinic with an **ulcerating mast cell tumor**, located subcutaneously over the left scapula. You immediately schedule the dog for a wide surgical excision after no evidence of metastatic disease is identified on a complete blood count, serum chemistry, thoracic radiographs, and abdominal ultrasound. Your technician asks you if there are any drugs she should avoid using in this dog. You tell her the following drugs are contraindicated in this patient:

- Propofol and morphine
- Atracurium and acepromazine
- Ivermectin and thiopental
- Morphine and thiopental
- Acepromazine and ivermectin

Explanation - In this case, **thiopental** is contraindicated because the patient is a **sighthound**. Thiopental is an ultra-short acting barbiturate. Recovery depends on redistribution to tissues, including fat. Because sighthounds have very little fat, they have prolonged recoveries and greater complications with these drugs.

Morphine is contraindicated in this patient due to the ulcerating mast cell tumor. Morphine can cause histamine release and should be avoided in mast cell tumor patients.

Question

Which of these is a major potential adverse side effect of the chemotherapeutic drug adriamycin in dogs?

- Cystitis
- Nephrotoxicity
- Cardiotoxicity

- Anaphylaxis
- Ileus

Explanation - The correct answer is cardiotoxicity. In addition to the usual side effects of chemotherapeutic drugs such as myelosuppression and GI side effects, a major concern with adriamycin administration is dose dependent cardiotoxicity. The drug that causes ileus is vincristine. The drug that causes anaphylaxis is L-asparaginase. The drug that causes nephrotoxicity is cisplatin. The drug that causes cystitis is cyclophosphamide.

Question

A 10 year old female spayed Labrador retriever mix presents for regurgitation and weight loss. Thoracic radiographs show an 8 cm cranial mediastinal mass and a gas filled esophagus. What is the most likely diagnosis of the mediastinal mass?

- Chemodectoma
- Lymphoma
- Thymoma
- Thyroid carcinoma

Explanation - The megaesophagus is caused by myasthenia gravis, which is occasionally seen with **thymomas**. Treatment of choice for thymomas is surgical excision. The myasthenia gravis typically resolves after removal of the thymoma. Although lymphoma is a reasonable differential for a mediastinal mass, the concurrent megaesophagus is more consistent with the scenario above.

Chemodectomas are heart base masses. An ectopic thyroid carcinoma could occur in the mediastinum but is rare and would be unlikely associated with megaesophagus.

Question

A 10-year old intact Siberian Husky presents with a history of regurgitation and exercise intolerance. On physical examination, you note the patient is thin. Blood work is unremarkable other than a stress leukogram and a slightly decreased albumin. What is the next diagnostic test you wish to recommend?

- Abdominal ultrasound
- Chest radiographs
- Prescapular lymph node aspirate
- Brain MRI
- Type 2M antibody test

Explanation - The correct answer is chest radiographs. Based on the clinical signs of regurgitation and exercise intolerance, you should be considering a thymoma. These tumors arise in the cranial mediastinum and are associated with causing myasthenia gravis and megaesophagus as

paraneoplastic syndromes. If a cranial mediastinal mass is present, your top two differentials should be thymoma or lymphoma.

As long as thymomas are well encapsulated, the prognosis is relatively good, and surgery via a median sternotomy should be recommended.

An abdominal ultrasound would be reasonable but not the next best choice as a diagnostic test. There are no examination findings that would indicate the necessity of a brain MRI. A type 2M antibody test is a test to rule out masticatory muscle myositis. A prescapular lymph node aspirate will likely be low-yield given the presentation and the fact that there was no enlargement indicated on physical examination.
