Question

Which is a reasonable plan for the treatment of bacterial pneumonia in a dog?

- Systemic antibiotics, cough suppressants, coupage, oxygen therapy
- Systemic antibiotics, bronchodilators, corticosteroids, oxygen therapy
- Coupage, systemic antibiotics, oxygen therapy, and nebulization
- Oxygen therapy, diuretics, bronchodilators, and systemic antibiotics

Explanation - The correct answer is coupage, systemic antibiotics, oxygen therapy, and nebulization. All of the choices include systemic antibiotics and oxygen therapy, which are absolutely indicated. Coupage and nebulization are also helpful adjuncts. Coupage may mechanically jar secretions and stimulate cough and can be performed for 5-10 minutes several times daily. Nebulization is to maintain airway hydration. It is not always necessary but is appropriate. Cough suppressants are contraindicated as are corticosteroids since they both interfere with normal defenses. Diuretics are contraindicated as well as they decrease airway hydration. Bronchodilators are controversial but are not a mainstay of therapy for pneumonia unless bronchoconstriction is present.

Question

A 6 year previously healthy old dog presents in acute respiratory distress. On physical exam, you auscult a split second heart sound. You take neck and thoracic radiographs which appear normal. What is the most likely cause of this dog's dyspnea?

- Pulmonary thromboembolism
- Aspiration pneumonia
- Pneumothorax
- Congestive heart failure

Explanation - The correct answer is **PTE**. PTE should be immediately suspected in any dog with **profound dyspnea** and **unremarkable radiographs**. The split second heart sound is heard due to **pulmonary hypertension** from the PTE. This is not congestive heart failure because the heart is not enlarged, and there is no pulmonary edema on the radiographs. Aspiration pneumonia is less likely because of the history and normal lung films. With pneumothorax, you would expect decreased dorsal lung sound and consistent radiographic changes.

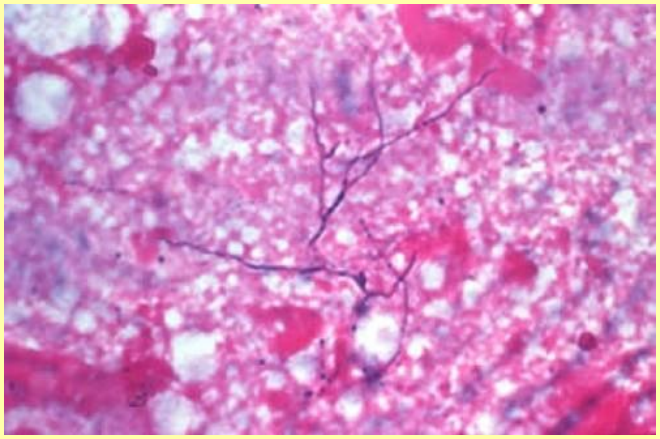
Question

A dog presents to your clinic for coughing and fever a week after going hunting. You work the dog up, perform bronchoscopy and remove a plant awn from the lungs. What bacterial infection is this dog predisposed to?

- Pasteurella multocida
- Actinomyces

- Staphylococcus aureus
- Staphylococcus pseudointermedius

Explanation - The correct answer is **Actinomyces**. This is a filamentous, branching, gram positive ,anaerobic bacteria that is a **normal inhabitant of the mouth and oropharynx**. It is commonly associated with **grass awn migration**. These are usually contaminated in the oropharynx and then migrate through the body from the respiratory or GI tracts. Many times it takes months to years to make a diagnosis.



Actinomyces bovis. Note the characteristic branching nature of these slender gram-positive rods

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Question

What is the treatment of choice for a primary lung tumor in the dog?

- Chemotherapy
- Excision with wide surgical margins
- Radiation therapy
- Marginal excision

Explanation - The correct answer is excision with wide surgical margins. If a primary lung tumor can be excised with wide margins, usually with **a lung lobectomy**, this is the best chance for a cure. Chemotherapy may be useful in cases where the tumor cannot be excised. Long-term prognosis is still guarded because **benign pulmonary neoplasia is uncommon.**

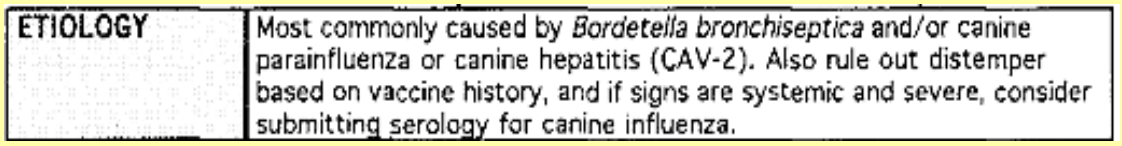
Question

A 5 year old female spayed dog arrives at your clinic with coughing and nasal discharge of 2 days duration. The dog has a history of being kenneled last week while the owners were on vacation. Which of the following is not a major differential?

- Bordetella bronchiseptica
- Simonsiella

- Mycoplasma
- Canine parainfluenza virus

Explanation - The correct answer is Simonsiella. This question should make you think of "canine infectious tracheobronchitis" (kennel cough). Bordetella is probably the cause (uses pili to attach to ciliated respiratory epithelial cells). Mycoplasma may also cause these clinical signs. Canine parainfluenza virus is the most common viral cause. Simonsiella is a normal inhabitant of the nasopharynx.



Canine Kennel Cough

Question

A 5 year old Rottweiler comes into your clinic after being kicked by a horse this morning. Physical exam is unremarkable except for a skin wound along the chest. You take thoracic radiographs and note three 1-2 cm regions of localized consolidation. What should you tell the client?

- These are most likely pulmonary contusions, they constitute a medical emergency and your dog needs surgery
- These are most likely pulmonary contusions, we should recheck X-rays in 10 days to see if they are progressing or regressing
- These are most likely pulmonary contusions, since your dog is not showing respiratory signs, they are not a problem
- These are most likely pulmonary contusions; your dog needs to be carefully monitored for the next day as they may worsen and lead to breathing problems

Explanation - The correct answer is these are most likely pulmonary contusions; your dog needs to be carefully **monitored for the next day** as they may worsen and lead to breathing problems. Pulmonary contusions can cause respiratory deterioration in the apparently stable patient for up to **24 hours after trauma**. They usually then improve over the next 24-48 hours. In this case, careful monitoring is probably indicated for 24 hours followed by recheck radiographs. These are indicated to detect possible abscesses, early pneumonia, cysts, or other related injuries.

Question

Which of these parameters tells you that an animal is hyperventilating?

- $PaCO_2$ >50 mmHg
- PaO_2 < 80 mmHg

- RR >60 bpm
- PaO2 >120 mmHg
- PaCO2 < 30 mmHg

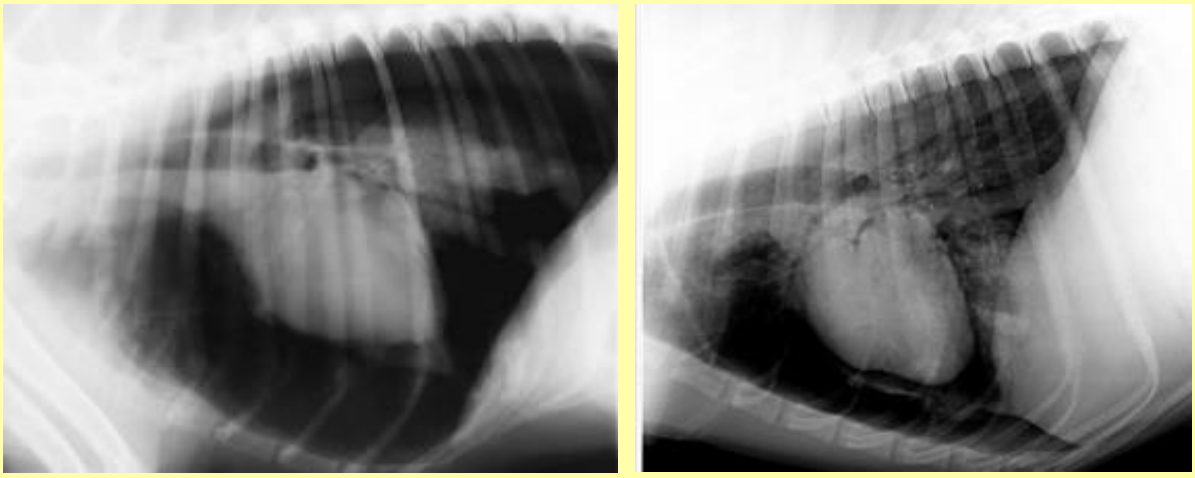
Explanation - The correct answer is PaCO2 < 30 mm Hg. **Ventilation is defined by the PaCO2**. **Normal is 35-45 mmHg**. A hypoventilated patient has a high PaCO2, and a hyperventilated patient has a low PaCO2.

Question

Which of these is NOT a likely cause of the pneumothorax for the dog in the picture?

- Pulmonary hypertension
- Ruptured bullae
- Penetrating trauma
- Migrating foxtail

Explanation - The correct answer is pulmonary hypertension. This is never a cause of pneumothorax, but rather results in right-sided heart failure. The others are possible causes of a pneumothorax. This dog has a chest tube and is hooked up to a continuous suction unit.



Question

Which of these groups is considered predisposed to developing nasal aspergillosis?

- Dolichocephalic
- Immunocompromised dogs
- Dogs in large groups or kennels
- Brachycephalics
- Hunting dogs

Explanation - The correct answer is dolichocephalics. Aspergillus is typically a disease of healthy, apparently immunocompetent dogs that are young to middle-aged. Dolichocephalic breeds are overrepresented. Immunocompromise does predispose to development of disseminated aspergillosis. Being in a large group of dogs does not increase risk, as it is not a contagious disease. Aspergillus is fairly ubiquitous in the environment, and hunting dogs are probably not exposed significantly more than any other dog.

Question

How pulmonary thromboembolism is definitively diagnosed in a live patient?

- Blood gas analysis
- Cytology
- Plain radiographs
- Contrast radiographs

Explanation - The correct answer is contrast radiographs. **Angiography is the gold standard for diagnosing PTE**. If positive, there are **sudden interruptions in blood and contrast flow**. Plain radiographs are often normal or have mild changes. Cytology samples would mainly show blood and would not be considered diagnostic or definitive. Blood gas changes typical for PTE are hypoxemia and hypocapnia, but these are not specific for PTE. CT angiography is also a reasonable test to confirm PTE.

Question

Which of these is most likely to provide a definitive diagnosis that a dog with chronic nasal discharge has nasal aspergillosis?

- Histopathology
- Serology
- CT scan
- Cytology
- Fungal culture

Explanation - The correct answer is histopathology. **Diagnosis** of nasal aspergillosis **is based on demonstrating the organism in diseased tissue**. A CT is great for looking at turbinate destruction but can look very similar if there is a nasal tumor. Cytology usually does not reveal fungal hyphae. Fungal culture is very unreliable; about one third of dogs with nasal tumors may have growth on fungal culture. Serology is also riddled with false negatives and positives. Histopathology usually reveals pyogranulomatous inflammation and necrosis with numerous fungal hyphae. The yield of biopsies can be greatly improved with assistance from **rhinoscopy** where white fungal plaques are often visualized. Diagnosis is sometimes made from rhinoscopy alone although this is less definitive than histopathology.

Question

What is the end-point of warfarin therapy in an animal with a pulmonary thromboembolism?

- An activated clotting time of 1.5 to 2 times normal
- A thrombin time of 1.5 to 2 times normal
- A partial thromboplastin time of 1.5 to 2 times normal
- A prothrombin time of 1.5 to 2 times normal

Explanation - The correct answer is a PT time of 1.5 to 2 times normal. PT is the best of these indexes to monitor warfarin therapy since, at these doses (usually 0.1-0.2 mg/kg), PTT and ACT will be unchanged. An even better method is to use the international normalization ratio (INR), which is a fancy way of taking into account how different PT reactions are run. The goal is to get an INR of 2.0 to 3.0.

Question

What is the treatment of choice for nasal aspergillosis in dogs?

- Surgery and antibiotics
- Topical antifungal therapy (i.e. Clotrimazole)
- Systemic corticosteroids
- Systemic antifungal therapy (i.e. Itraconazole)

Explanation - The correct answer is **topical antifungal therapy**. Topical antifungal therapy is considered more efficacious and less costly than long-term systemic antifungal therapy. Corticosteroids would be contraindicated. Surgery and antibiotics would not be successful in controlling a fungal infection. The currently recognized treatment of choice is clotrimazole, a synthetic imidazole that has an 80% cure rate with single administration. The main potential complication is **CNS exposure** to the drug if there has been erosion of the cribriform plate.

Question

What does cyanosis generally indicate?

- Hypoventilation- PaCO2 >60
- Anemia- PCV < 15
- Hypoxemia -PaO2 of < 50 mm Hg
- Cyanide toxicity

Explanation - The correct answer is hypoxemia. Cyanosis or blue mucous membranes is an indicator of oxygenation and is generally observed when arterial PO2 is less than 50.

Question

Which of these is least likely to cause respiratory distress and an increase in respiratory rate in animals that are victims of smoke inhalation (as in smoke from a fire, not a cigarette)?

- Laryngeal edema
- Carbon dioxide inhalation
- Thermal damage to the bronchi
- Carbon monoxide inhalation

Explanation - The correct answer is thermal damage to the bronchi. Carbon monoxide inhalation is an important component of smoke inhalation morbidity as it leads to carboxyhemoglobin formation and displacement of oxygen. Carbon dioxide inhalation at high levels leads to severe acidosis, which leads to an increase in respiratory rate. Damage to the larynx from the heat causes edema and swelling, contributing to upper airway obstruction. The heat damage does not usually reach the level of the bronchi or lower airways. Smoke also can inhibit pulmonary macrophage function, and skin burns can worsen pulmonary status.

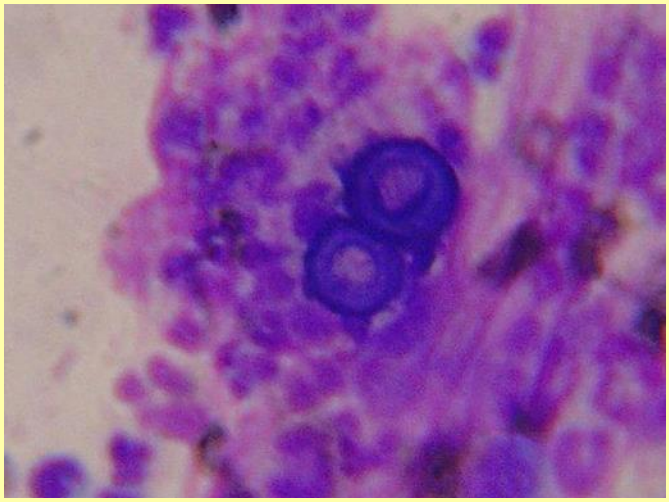
Question

A 3 year old male Weimaraner presents to your clinic with complaints of anorexia, weight loss, and progressive exercise intolerance and dyspnea with a dry, hacking cough. On physical exam, he is cachectic (BCS 2/9), febrile (103.8), and has diffuse peripheral lymphadenopathy. Thoracic radiographs show a diffuse **nodular interstitial pattern** in all lung fields. Cytology of a lymph

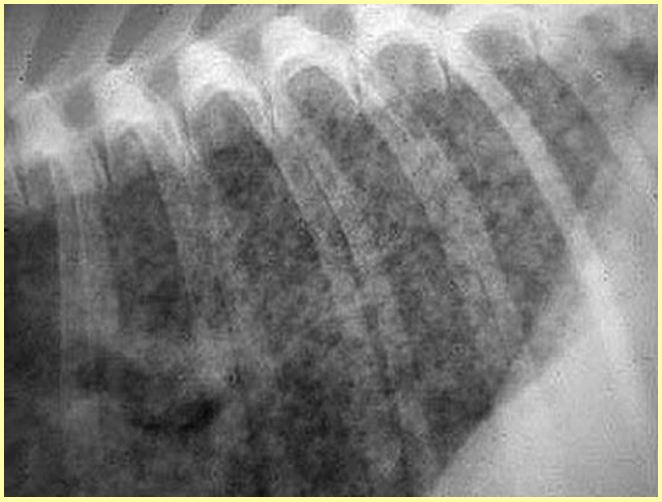
node aspirate shows suppurative inflammation. What is the MOST likely diagnosis to explain all of these findings?

- Lymphosarcoma
- Blastomycosis (Blastomyces dermatiditis)
- Kennel cough (Bordetella bronchiseptica)
- Plague (Yersinia pestis)

Explanation - The correct answer is blastomycosis. These findings are most consistent with blastomycosis. Lymphoma would be a great differential but is less consistent with the **nodular lung pattern and suppurative inflammation** in the lymph node. Plague is an interesting differential for the lymphadenopathy and cytology findings but is not consistent with the lung pattern or history. This Weimaraner's disease is too severe to be explained by kennel cough alone. While this diagnosis is sometimes made easy by visualization of organisms in aspirates or skin scrapings, it is not always seen as in this case. Remember, Blastomyces is seen as **broad-based budding yeast.** The next step to obtain a definitive diagnosis in this patient would be a **TTW** or **BAL**.



Smear from foot lesion of blastomycosis showing Blastomyces dermatitidis yeast cell undergoing broad-base budding

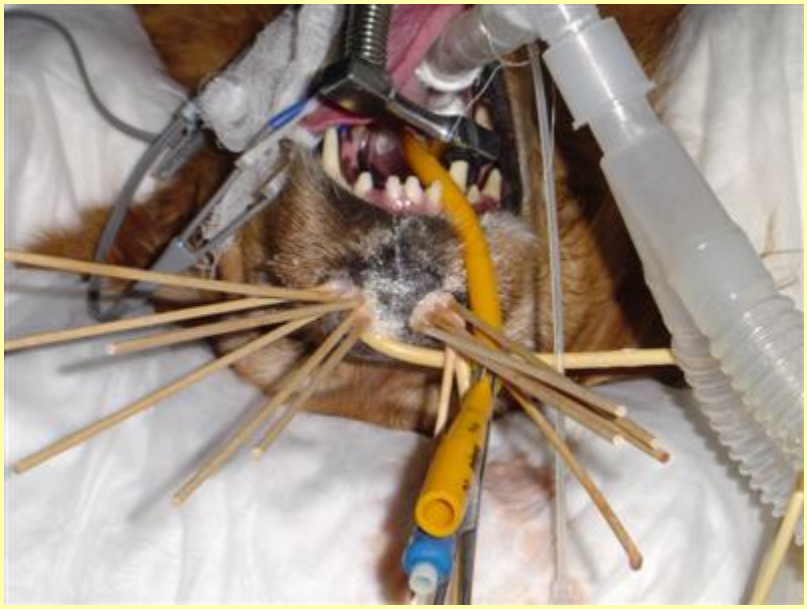


Thoracic radiograph from a dog with blastomycosis, showing diffuse miliary to nodular interstitial infiltrate

Location: Found in the soil around the great river valleys and tributaries in North America and Canada (e.g. Mississippi, Missouri, and the Ohio River Valleys.)	Hyphae produce conidiophores which are inhaled into the lungs causing microgranulomas. Yeast rapidly form and divide within macrophages and disseminate to lymph nodes. Infected individuals more frequently develop severe or progressive disease than with histoplasmosis or coccidiomycosis. Dissemination from the lungs to the skin is common.	**Dog**: Pulmonary (cough, dyspnea), bone (osteolysis and periosteal proliferation), ocular (uveitis, chorioretinitis, retinal detachment), and skin (papule, nodule, draining tract) forms are most common. The CNS can also be involved. **Cat**: Same as dogs but CNS involvement is more common.	**Diagnosis**: **Cytology** of draining tracts is the best method (many organisms are found). **Serology** can be helpful. It tests for A-antigen. Agar diffusion has a 60-90% sensitivity and 96% specificity. You can get false negatives due to production of antibodies though. **Treatment**: Itraconazole at 5 mg/kg PO BID for 5 days and then SID for 3 days past resolution of signs is the therapy of choice. (Cats stay on BID treatment). 70-75% of cats and dogs do well with treatment. Fluconazole or amphotericin B can also be used.

Question

What is the most likely complication associated with the post-anesthetic recovery of the dog in the photograph receiving Clotrimazole?



- Aspiration pneumonia
- Laryngeal inflammation
- Bacterial rhinitis
- Seizure

Explanation - The correct answer is **laryngeal inflammation**. Seizure is a possible sequela if the cribriform plate is compromised. If this were the case, the complication would likely be fatal. With severe swelling, the administration of corticosteroids and re-intubation is indicated. Sometimes these dogs may need to be intubated for days.

Question

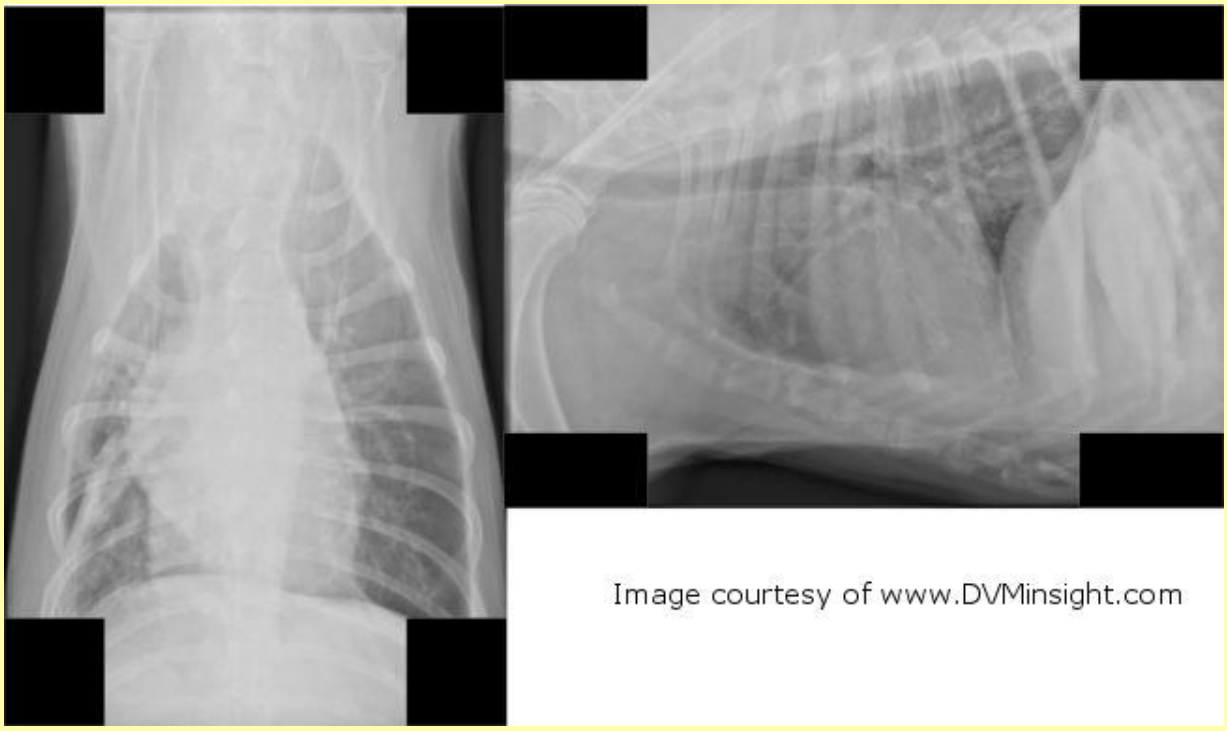
Which of the following is the most likely cause of lymphoplasmacytic rhinitis as seen in this patient?

- The specific etiology is still unknown
- Canine adenovirus-2
- Bartonella
- Parainfluenza virus-3

Explanation - As the name implies, these patients have a mixed population of lymphocytes and plasma cells when biopsied. Many consider the condition to be an idiopathic immune-mediated disorder. PCR studies have been performed in affected patients in search of parainfluenza virus-3, canine adenovirus-2, Bartonella, and Chlamydophila. None of these agents were found to be a potential cause. Typical clinical signs include a history of unilateral or bilateral nasal discharge **of several months duration**. Large-breed dogs are more often affected and the age may vary. Animals usually don't respond to Treatment.

Question

A 5 year old female Weimaraner presents to your clinic with the presenting complaint of cough and difficulty breathing. On exam, the dog is subdued but responsive with a temperature of 103.3F, heart rate of 120 beats per minute and respiratory rate of 50 breaths per minute. You perform chest radiographs which are shown below. A CBC shows a hematocrit of 31%, neutrophil count of 17,275/ul, monocyte count of 1,484/ul and eosinophil count of 630/ul. What is the treatment of choice?



- Oxygen and furosemide
- Oxygen, ampicillin, and enrofloxacin
- oxygen, acepromazine, and hydromorphone

- Oxygen and dexamethasone sodium phosphate

Explanation - The correct answer is oxygen, ampicillin, and enrofloxacin. This case and radiograph represent an example of a **severe bronchopneumonia**. While it would be appropriate to consider more diagnostics, such as a transtracheal wash for cytology and culture, you may have to make a choice without all of that information on your exam. For the information that you do have, aggressive and broad spectrum antimicrobial therapy with ampicillin and enrofloxacin is the best answer, with supportive care with oxygen as needed. Furosemide and oxygen would be the recommended treatments for a dog with congestive heart failure. Sedation and oxygen might be needed for a dog in severe distress from airway obstruction. Corticosteroids would not be an acceptable primary treatment for pneumonia.

Note increased Lung density on chest X-ray (**air bronchograms**) indicative of Broncopneumonia and increased lung density.

http://www.marvistavet.com/html/body_pneumonia_management.html

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Question

A 2 year old male dog presents after being hit by a car. You take thoracic radiographs to look for evidence of trauma. Which of these findings would not occur from trauma?

- Rib fractures
- Pulmonary contusions
- Peritoneopericardial diaphragmatic hernia
- Pleuroperitoneal diaphragmatic hernia

Explanation - The answer is peritoneopericardial diaphragmatic hernia. Pleuroperitoneal diaphragmatic hernias or what most of us think of as regular diaphragmatic hernias can be congenital or traumatic in origin. Trauma can cause an abrupt increase in intra-abdominal pressure forcing the lungs to rapidly deflate causing a large pleuroperitoneal pressure gradient. This pressure gradient can cause the diaphragm to tear at its weakest point, typically the muscular portions. Peritoneopericardial hernias are always congenital in dogs and cats (**interestingly, they can be caused by trauma in humans**). Hopefully, rib fractures and pulmonary contusions were obvious.

Question

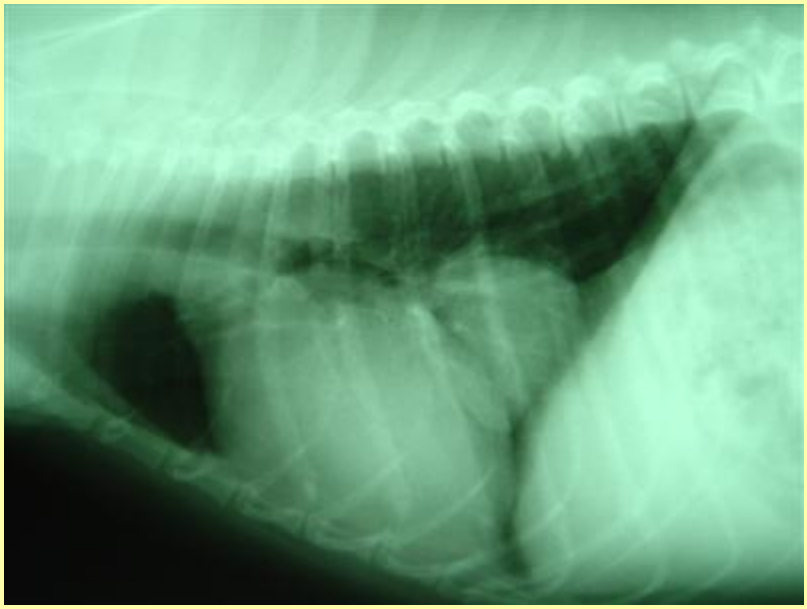
What additional radiographic view in addition to a standard respiratory series should be taken to assess suspected intrathoracic tracheal collapse?

- End expiratory thorax
- End inspiratory thorax
- Oblique thorax
- Standing lateral thorax

Explanation - The correct answer is end expiratory thorax. An end inspiratory view should be part of any normal thoracic radiograph series. An end-expiratory view is needed to document tracheal collapse in order to demonstrate intrathoracic tracheal narrowing because intrathoracic pressure is highest at end expiration which may worsen intrathoracic airway collapse. Standing lateral views are sometimes used to look for pleural effusion or pneumothorax. Oblique thorax projections are not used.

Question

This radiograph is of a dog with a one month history of coughing. What is your diagnosis?



- Lung mass
- Lymphoma
- Pneumothorax
- Pneumonia

Explanation - The correct answer is lung mass. At this point we don't know if this is a metastatic lesion or a primary lung mass. Further diagnostics would be indicated determine the origin of the mass. The mass is located in the region of the caudal vena cava.

Question

A 5-month old English Bulldog has difficulty breathing, stertor, and a cough. Which set of abnormalities is most likely present in this patient?

- Tracheal collapse, laryngeal paralysis, and an elongated soft palate
- Tracheal hypoplasia, stenotic nares, and an elongated soft palate
- Tracheal collapse, laryngeal paralysis, and an elongated hard palate
- Tracheal hypoplasia, stenotic nares, and an elongated hard palate

Explanation - The correct answer is tracheal hypoplasia, stenotic nares, and an elongated soft palate. Young brachycephalic dogs are often afflicted with a number of upper airway abnormalities collectively termed the brachycephalic airway syndrome. **These are tracheal hypoplasia, stenotic nares, elongated soft palate, everted laryngeal saccules, and laryngeal collapse**. It is easy to get these confused with tracheal collapse, which affects older toy and miniature dogs. The difference is that tracheal hypoplasia is a congenital narrowing of the trachea (Definition: lumen is less than twice the width of the third rib where they cross on radiographs), and collapsing trachea is an abnormality in the tracheal rings themselves.

Question

What is the difference between stertor and stridor?

- Stridor indicates upper airway obstruction, while stertor indicates lower airway disease
- Stridor is another word for wheeze while, stertor is another word for crackles
- Stertor is a gurgling noise usually generated in the nasal passages, while stridor is a high-pitched sound usually generated near the larynx
- Stridor is audible without a stethoscope, while stertor requires a stethoscope to hear

Explanation - The correct answer is that stertor is a gurgling noise usually generated in the nasal passages while stridor is a high-pitched sound usually generated near the larynx. This is always a source of confusion for veterinary students. Both noises are audible without the aid of a stethoscope and indicate an extrathoracic problem.

https://youtu.be/isi04TqrM4k

Question

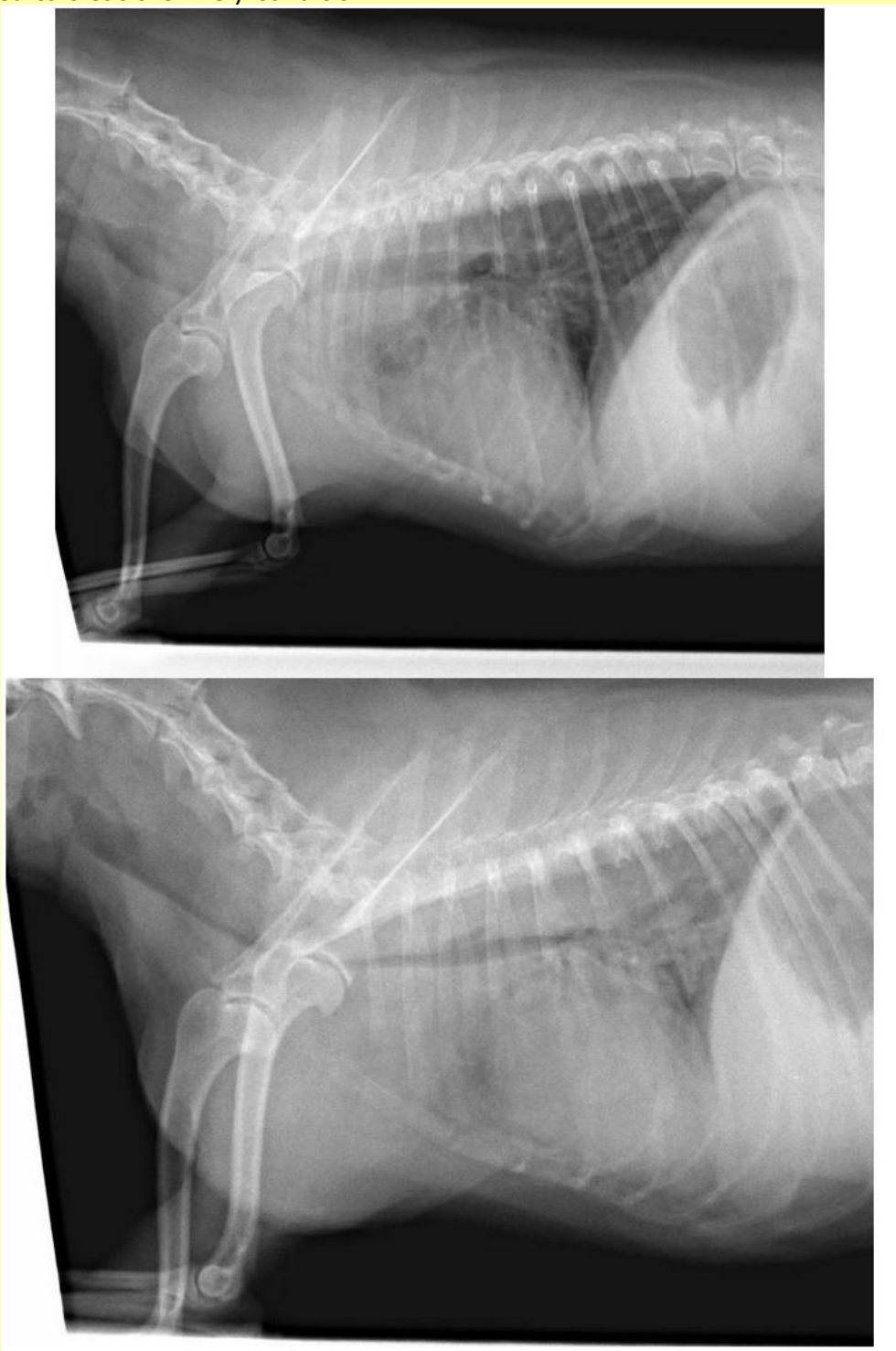
Which is a cause of primary bacterial pneumonia in dogs?

- Pseudomonas aeruginosa
- Bordetella bronchiseptica
- Mycoplasma pneumoniae
- Pasteurella multocida

Explanation - Although not common, Bordetella infections can develop into a primary pneumonia, particularly if the dog has a weakened immune system. Mycoplasma pneumoniae is a bacteria that can cause a primary pneumonia in humans, but it is not known to be a problem in dogs. The other choices require an underlying problem such as aspiration, foreign body, viral infection, neoplasia, etc. to be present in order to create an infection. Secondary bacterial infections can be extremely severe and need to be diagnosed and treated appropriately and aggressively.

Question

A 10-year-old male Pomeranian presents to you with a 3-month history of wheezing and marked respiratory distress. The owner reports that he has been coughing sporadically as if trying to clear his throat of a hairball. The owner is a regular smoker. On your examination, the dog displays moderate expiratory difficulty. You submit blood work and take radiographs including inspiratory and expiratory lateral projections of the dog, which are shown below. Which of the following are commonly used to treat the likely condition?



- Surgical repair of the defect
- Meloxicam and fluconazole
- Furosemide and prednisone
- Amoxicillin, nebulization, and coupage
- Butorphanol and theophylline

Explanation - The radiographs show dynamic collapse of the intrathoracic trachea, carina, and mainstem bronchi. There is a marked redundant tracheal membrane in the cervical region. The left atrium may be slightly enlarged but there is no evidence of left heart failure. Based on these findings, you should suspect that tracheal collapse is the cause of the dog's clinical signs.

Treatment options include **bronchodilators** (i.e. theophylline, terbutaline), **cough suppressants** (hydrocodone, butorphanol), **weight loss**, and **corticosteroids** to control inflammation. In severely affected dogs, sedation may be necessary to break the cough cycle. Dogs should be kept away from smoke and environmental pollution. About 70% of dogs respond to medical management. Those that don't are sometimes treated with stents or tracheal rings, but neither repairs the underlying cartilaginous defect.

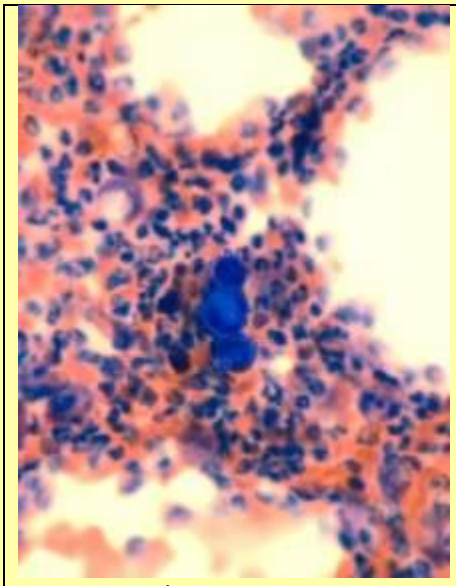
Furosemide is not an appropriate treatment as there is no evidence of heart failure. Nebulization and coupage are used to treat pneumonia, which is also not present in this case.

Question

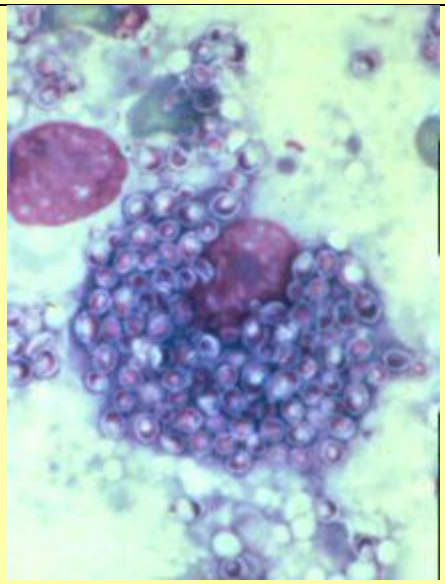
You suspect Coccidioidomycosis in your canine patient. Demonstration of which of these in a sample from a bronchoalveolar lavage would confirm your suspicions?

- Spherule
- Broad-based budding yeast
- Small round intracellular yeast
- Branching fungal hyphae
- Small yeast with a very large clear capsule

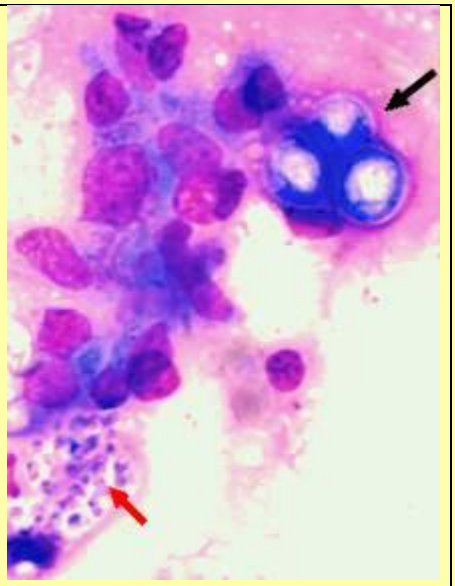
Explanation - The correct answer is spherule. The diagnostic stage of Coccidioides immitis is the spherule. This is a 20-200 micrometer round, double-walled structure containing many endospores. As a reminder, the broad-based budding yeast is Blastomyces. The small yeast with large capsule is Cryptococcus, and the branching fungal hypha is Aspergillus. The small intracellular yeast is Histoplasma.



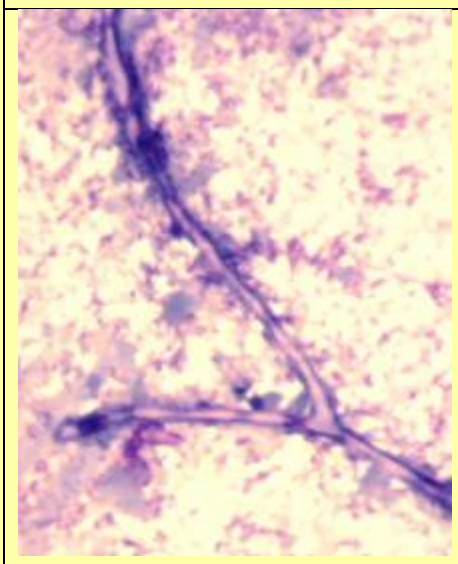
Blastomycosis



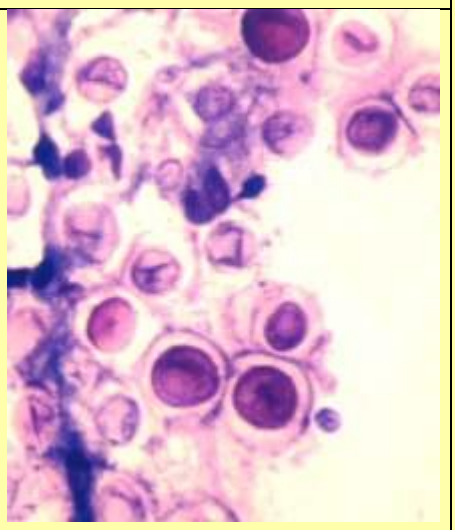
Histoplasmosis



Coccidiomycosis



Aspergillosis



Cryptococcosis

Question

A 10-year old Golden Retriever has presented for a progressive onset of exercise intolerance and voice change. On physical exam the patient is noted to have a 7/9 body condition score. Mucous membranes are pink. Capillary refill time is less than 2 seconds. Lung sounds are clear bilaterally. Stridorous breathing is noted on inspiration. Laryngeal paralysis is suspected and a sedated laryngeal exam has been recommended. The owner agrees to routine blood work, chest radiographs, and a laryngeal examination. Which of the following medications will help assist in evaluation of laryngeal function?

- Dopamine
- Diphenhydramine
- Propofol
- Doxapram
- Ketamine

Explanation - Doxapram is a central nervous stimulant that has effects on respiratory centers. It is thought that it may work by stimulating the reflex activation of carotid and aortic chemoreceptors. At one point, it was used in critical care patients during resuscitation efforts; however, this has fallen out of favor since doxapram results in increased work associated with respiration without an increased amount of arterial oxygenation. When performing a laryngeal exam, the goal is to have the patient just deep enough so you can perform a laryngeal exam. Injectable anesthetics such as thiopental or propofol are used. Overzealous administration of these can result in a false diagnosis of laryngeal paralysis and it is therefore recommended to administer Doxapram to help stimulate respiration and definitively confirm your diagnosis.

Ketamine is an NMDA antagonist and can result in increased jaw tone as well as overall muscle tone. Although its cardiopulmonary effects are minimal, it does not stimulate respiration.

Dopamine is a precursor to norepinephrine and acts on alpha and beta-1 receptors. It is typically used in critical care settings to help increase blood pressure.

Diphenhydramine is the antihistamine also known as Benadryl. It competitively inhibits histamine at H1 receptors. Along with its antihistamine properties, it has sedative and anti-tussive effects.

Propofol is a rapid acting injectable anesthetic which can result in hypotension, bradycardia, and apnea.

Question

Following a routine spay, a dog exhibits moderate respiratory distress upon recovery that worsens over the next two hours. You take radiographs and see a bronchoalveolar pattern in the cranial lung field. What is your biggest concern?

- The surgeon probably caused a pneumothorax during surgery
- The dog is probably exhibiting an excitement phase from anesthesia
- The dog probably has pneumomediastinum from tracheal tube trauma
- The dog probably has aspiration pneumonia

Explanation - The correct answer is that the dog probably has aspiration pneumonia. Aspiration pneumonia is the most likely complication from this type of anesthesia and surgery. Coupled with the radiographic findings, it is the best choice. A pneumothorax from surgery or pneumomediastinum from tracheal tube trauma could both certainly occur but don't quite fit this scenario. If you were wondering how soon you would see respiratory signs from aspiration and radiographic signs, it can be very quickly.

Question

Which is not a recognized cause of non-cardiogenic pulmonary edema?

- Hypertension
- Electrocution

- Pulmonary thromboembolism
- Upper airway obstruction
- Head trauma

Explanation - The correct answer is hypertension. There are multiple causes of non-cardiogenic edema. Hypertension is a potential cause of cardiogenic pulmonary edema as systemic hypertension can lead to damage to the left ventricle and eventual left-sided heart failure. Systemic hypertension does not cause non-cardiogenic pulmonary edema. Other major causes of non-cardiogenic pulmonary edema are vasculitis, liver disease, seizures, toxins, envenomation, DIC, direct trauma, and sepsis.

Question

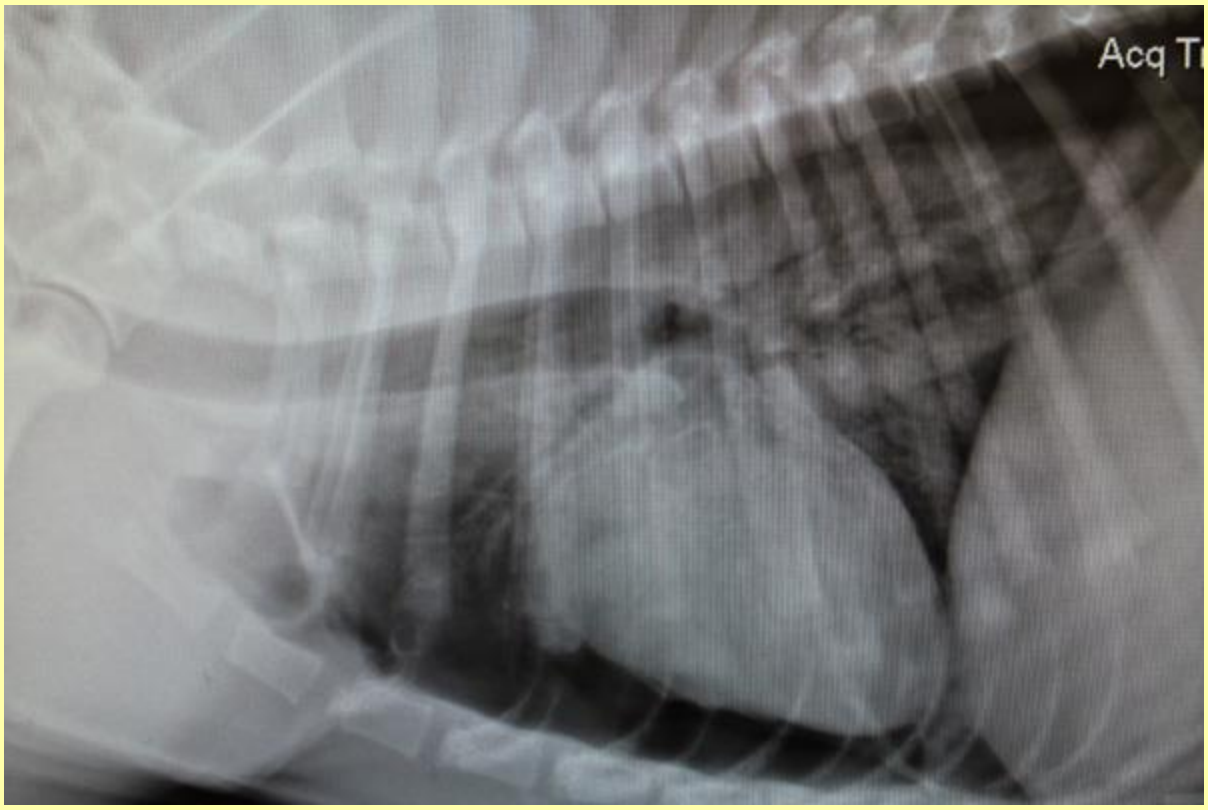
Which of the following is the most likely diagnosis for cough in a 2-month old puppy?

- Toxascaris leonina infection
- Toxocara canis infection
- Trichuris vulpis infection
- Dirofilaria immitis infection

Explanation - The correct answer is Toxocara canis infection. Toxocara canis is a canine roundworm that is passed along to puppies transplacentally. The roundworms migrate from the small intestines through the liver and lungs, which is what causes the animal to cough. Beyond 6 months of age, the larvae distribute to the somatic tissue, where their development is arrested. Dirofilaria immitis or heartworm disease takes at least 6 months before the infection is patent. It would take even longer for the infection to progress to congestive heart failure, causing the dog to cough. Trichuris vulpis, the canine whipworm, and Toxascaris leonina, another canine roundworm, do not migrate through the lungs.

Question

A 4-year old female spayed mixed breed dog presents for further evaluation. She has a 24 hour history of increased respiratory rate and decreased appetite. Owners note that she is an indoor/outdoor dog. Based on these radiographs, what is the best treatment?



- Intravenous furosemide
- Pericardiocentesis
- Thoracocentesis
- Left caudal lung mass removal

Explanation - The correct answer is thoracocentesis. This patient has a left sided pneumothorax. Pneumothorax can be secondary to trauma, ruptured bullae, infection, or neoplasia. The radiograph shows an elevated heart off the sternum as well as collapse of the lung lobes. Notice there are no bronchi or vessels extending caudally toward the diaphragm due to collapse of the lung.

Pericardiocentesis would be indicated if you had a very large globoid heart, suggestive of pericardial effusion. The heart does not appear enlarged and there is no pulmonary edema making intravenous furosemide a poor choice. Do not confuse a collapsed lung lobe for a lung mass.

Question

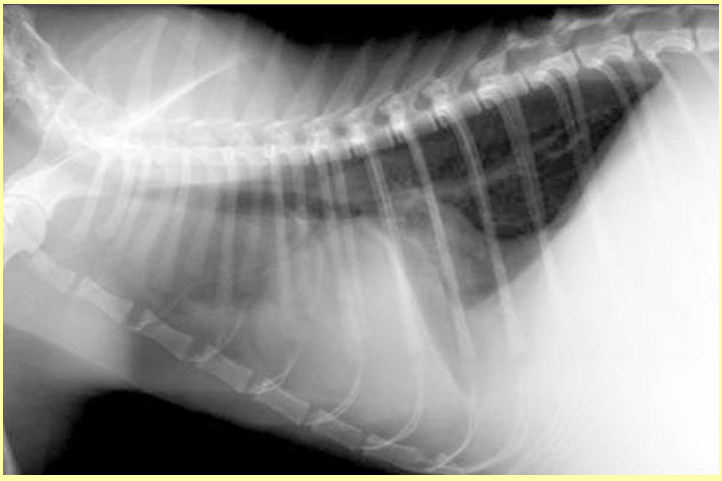
A 7-year old male intact Labrador Retriever presents for an increased respiratory effort. Chest radiographs were performed which were indicative of pleural effusion. Which of the following is the most reliable radiographic sign that would be indicative of pleural effusion?

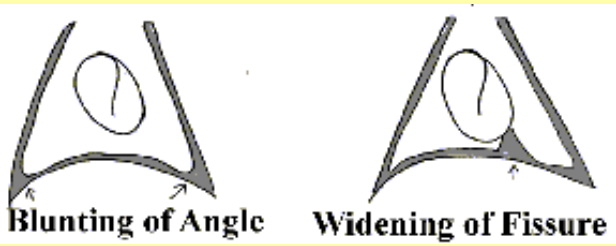
- Lobar sign on both lateral and ventrodorsal projections
- Air bronchogram on both lateral and ventrodorsal projections
- Retracted lung lobes on both lateral and ventrodorsal projections
- Pleural fissure lines on both lateral and ventrodorsal projections

Explanation - Pleural fissure lines are typically diagnostic for pleural effusion. The fissures are the normal divides between the lung lobes and are not visualized on radiographs unless there is fluid in the chest or the pleura is very thickened. When there is a large amount of fluid, you may begin to appreciate a loss of detail, and it is possible lung lobes will collapse as a result of an inability to properly expand in the face of the pleural effusion.

A lobar sign is seen when there is a line of demarcation between a radiopaque (normal) lung lobe and a radiodense (consolidated) lung lobe. There can be several causes for a lobar sign including hemorrhage, edema, or pus within the lobe.

An air bronchogram is seen when alveolar edema occurs as a result of fluid accumulating within the alveoli. Alveolar edema will result in a sharp contrast between the fluid in the alveoli and the air in the bronchi.





Question

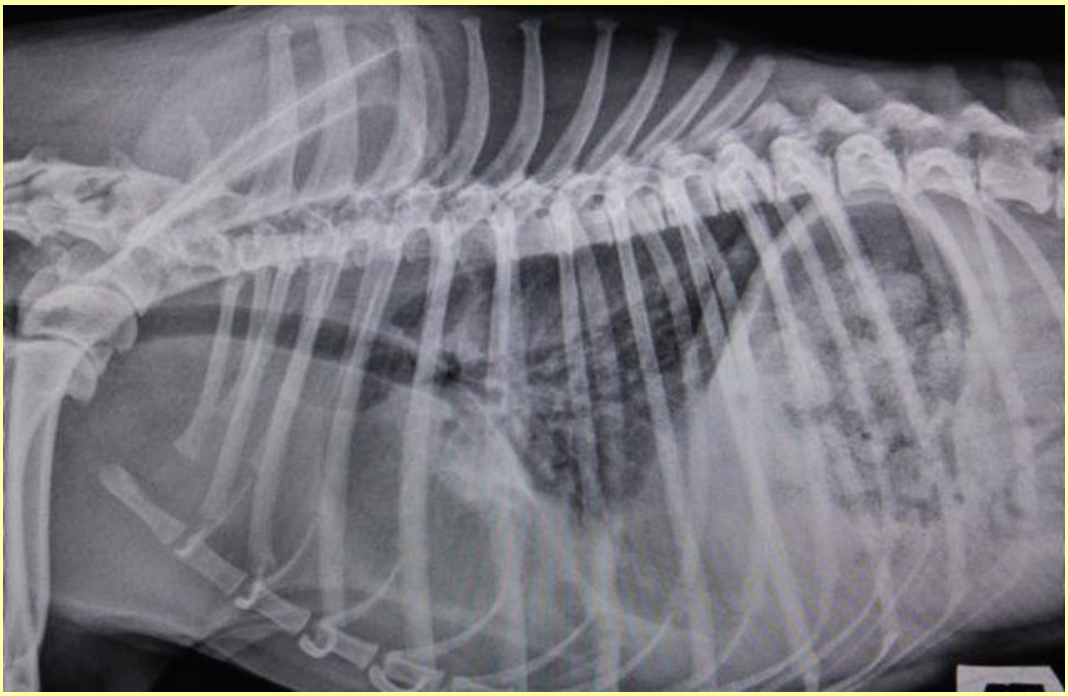
A 4-year old female spayed mixed Chihuahua presented to the emergency service at approximately 5am this morning after presumptively being attacked by a coyote. The patient has a flail chest and it is questionable if there is direct communication between the thoracic cavity and the environment (it was difficult to examine the dog due to her fractious nature). Exploration of the wound was performed, and once anesthetized, it was apparent she had a pneumothorax. The patient must be ventilated, as there is no vacuum present in the chest for lung expansion to occur. What pressure should the anesthetist not exceed if manually bagging the patient during anesthesia?

- 24cm H2O
- 20cm H2O
- 12cm H2O
- 8cm H2O

Explanation - Pressures above 20cm H20 may result in barotrauma. In an otherwise healthy patient it is not recommended to exceed this pressure. In patients with chronic atelectasis, anesthetists will be much more apprehensive about over ventilating or ventilating the lungs too quickly, as acute expansion can trigger re-expansion pulmonary edema, which may then lead to acute respiratory distress syndrome and death.

Question

A 9-year old male castrated mixed breed dog presents with a history of intermittent coughing and increased respiratory effort. He had been treated empirically for the past two weeks with antibiotics and no clinical improvement has been appreciated. The owners have finally consented to chest radiographs and those reveal an atelectic right middle lung lobe, no visualization of the bronchi in the region of the middle lung lobe, and pleural effusion. Which of the following options is the most likely differential?



- Persistent aortic arch
- Lung lobe torsion
- Aspiration pneumonia
- Heart failure

Explanation - The history and radiographic findings should help rule out aspiration pneumonia and heart failure. A persistent right aortic arch (PRAA) is highly unlikely as this is a congenital condition diagnosed early on in life. Clinical signs of a PRAA include regurgitation, a ravenous appetite, and a poor body condition. Radiographic signs would show a narrowing of the esophagus at the location of the anomaly and a megaesophagus cranial to the site of the vascular anomaly. Occasionally you will also see a megaesophagus caudal to the vascular anomaly.

We currently don't know the exact etiology of lung lobe torsions; however deep chested dogs such as Afghan hounds are predisposed. Additionally it is thought that having a pleural effusion or a prior lung lobectomy may facilitate a lobe torsion. Clinical signs are usually similar to those in this question. A tip off to the potential of having a lung lobe torsion is that the bronchi of the right middle lung lobe cannot be visualized. Pleural effusion and atelectasis are also supportive but may also be appreciated other disease processes such as trauma and a lung lobe abscess.

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

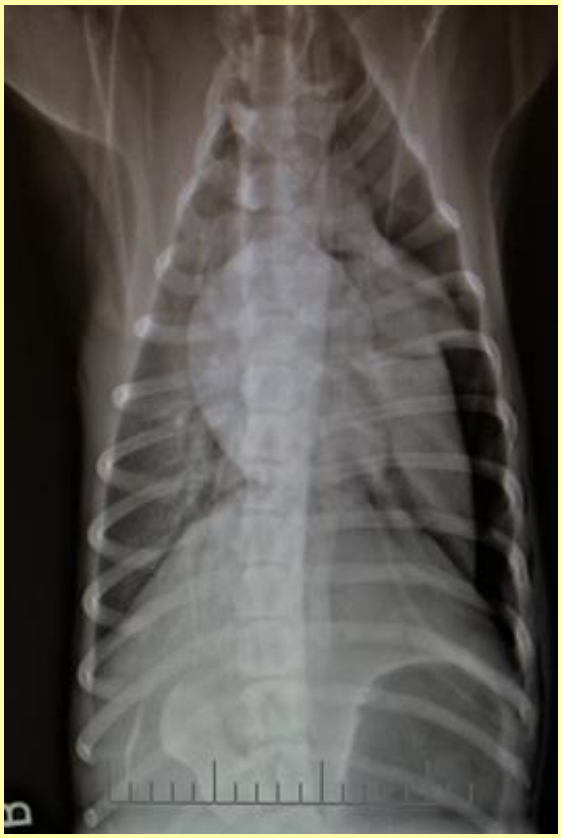
In an animal with pleural effusion, which radiographic view will give you the best view of the heart?

- Ventrodorsal
- Left lateral
- Right lateral
- Dorsoventral

Explanation - The correct answer is ventrodorsal. Pleural effusion obscures the heart completely on a dorsoventral radiograph and at least partially on lateral radiographs. Ventrodorsal positioning usually moves the pleural fluid away from the heart and allows for a radiographic view of the heart to be obtained. Of course, in dyspneic animals, it may not be wise to position them ventrodorsally.

Question

The radiograph below is of a patient with a mild increase in respiratory rate of 54 bpm that was admitted after being found wandering along the middle of the road. On physical examination, the patient is bright, alert, and responsive. There are decreased lung sounds in the left dorsal quadrant and several abrasions are noted on the forelimbs. Pulse oximetry on the gingiva was 94%. What is the best treatment option?



- Perform a left sided thoracocentesis on the ventral aspect of the chest
- Perform a right sided thoracocentesis on the dorsal aspect of the chest
- Perform a left sided thoracocentesis on the dorsal aspect of the chest
- Place a thoracotomy tube on the right side
- Perform a right sided thoracocentesis on the ventral aspect of the chest

Explanation – The correct answer is Perform a left sided thoracocentesis on the dorsal aspect of the chest. This is a classic radiograph of a left sided pneumothorax. This case provides the advantage of having a "normal" right side. Notice the lungs are collapsed on the left and no vasculature or airways can be appreciated on the left as compared to the right. In a standing patient it is best to perform a thoracocentesis dorsally since air rises. This will yield the most amount of air to aspirate. In most cases with a pneumothorax secondary to trauma it is not necessary to place a chest tube as the leak seals over quickly, making a chest tube excessive; however, patients that are tapped must be monitored closely for recurrence of pneumothorax. If air build up persists more aggressive treatment such as a chest tube with or without continuous suction should be considered.