

Title:

Diagnosis and Management of Bacterial Pneumonia

Session Description:

Prompt diagnosis and institution of appropriate antibiotics is essential for successful management of bacterial pneumonia. We will explore how bacterial pneumonia causes systemic illness, methods for its diagnosis, and relationship of community-acquired and hospital-acquired pathogens to appropriated choices of antibiotics.

Lecture Notes:

Bacterial pneumonia is not uncommon in dogs. It is typically associated with enterobacteriaceae (e.g. *E. coli*, *Klebsiella spp.*, *Enterobacter spp.*, etc.), however gram-positive infections with *Staphylococcus spp.* and *Streptococcus spp.* are possible as well. While these are typically associated with aspiration events, infectious bacterial pneumonia can be caused by *Bordetella bronchiseptica* and *Mycoplasma spp.*, among others. Diagnosis of bacterial pneumonia revolves around thoracic imaging (typically thoracic radiographs), airway sampling and bacterial culture. Dogs with aspiration pneumonia may have pulmonary infiltrates in the cranial and /or middle lung lobes, however acute high-velocity aspiration can be associated with a caudodorsal interstitial to alveolar pattern. Infectious pneumonia varies in its presentation on thoracic imaging as well. While we think of aspiration pneumonia as settling in the ventral lung lobes it is possible for infectious pneumonia to do the same. The difficulty distinguishing pneumonia types on thoracic imaging highlights the importance of airway sampling. Endotracheal wash may be preferred in larger dogs due to the need for long catheters to reach the lower airways. This technique requires heavy sedation/general anesthesia and a sterile endotracheal tube. It may not be the best choice for unstable patients. Smaller dogs' airways can be sampled using the trans-tracheal technique. This can be performed in awake or sedated patients making it preferred in unstable patients. Regardless of the technique employed supplemental oxygen can be helpful peri-procedurally for dogs with respiratory compromise. Patients with pneumonia are susceptible to dysfunction of not only of the lungs but any organ system in the body (i.e. severe sepsis, multiple organ dysfunction syndrome). Patients with hypoxemia (pulse oximetry [SpO₂ > 95%] or arterial blood gas [PaO₂ <80mmHg] or have lab work changes consistent with organ dysfunction (azotemia, hyperbilirubinemia, thrombocytopenia, etc.) are likely to benefit from hospitalization for supplemental oxygen, IV antibiotic therapy and supportive care (intravenous fluids, nebulization, etc.). While awaiting bacterial culture results, empirical antibiotic choices for these patients should be broad-spectrum and result in the least risk of toxicity possible. Choices include ampicillin/enrofloxacin, clindamycin/third-generation cephalosporin, or ampicillin/amikacin. Nebulization with an aminoglycoside/saline solution can be considered as well. Once the bacterial culture results are available de-escalation to the "lowest gun" oral antibiotic possible is recommended. In other words, it's okay to treat with amoxicillin or cephalexin as sole therapy based on culture results. Typically, hospitalization is recommended until the patient is breathing comfortably on room air, preferably with normal oxygen saturation of hemoglobin, and eating well while tolerating oral antibiotics. While the length of antibiotic treatment has been poorly investigated in small animal medicine, treatment for 2 weeks past

resolution of radiographic changes is recommended. There is a recent consensus statement regarding treatment of canine infectious respiratory disease complex (CIRDC, aka “Kennel Cough”) that is open source through the journal of veterinary internal medicine. The authors state that dogs with suspected CIRDC are unlikely to require antibiotics in the absence of systemic illness (fever, lethargy, anorexia) due to most infections being viral in nature. If the clinical signs persist past 10 days or if signs of systemic illness are noted, empirical therapy with doxycycline, enrofloxacin or azithromycin is indicated. Antibiotic resistance has become a more recognized phenomenon as their usage becomes more common. Recent antibiotic therapy (within 30 days) or hospitalization (>24-48 hours) increases the risk of developing a resistant bacterial infection. Up to 60% of dogs with hospital acquired pneumonia demonstrate MDR isolates, including 65% resistance to amoxicillin/clavulanate and 52% resistance to enrofloxacin. Airway sampling is very important in these patients so that antibiotic therapy can be tailored to their needs. Antibiotics with the lowest resistance rates in these patients includes amikacin, ceftazidime and imipenem/meropenem. Empirically, it is recommended to start with one of the aforementioned three antibiotics prior to de-escalation, if possible, based on bacterial culture results.

References

- Antimicrobial guidelines for treatment of respiratory tract infections in dogs and cats: antimicrobial guidelines working group of the International Society for Companion Animal Infectious Diseases. JVIM 2017; 31: 279-294