

# METROPOLITAN VETERINARY ASSOCIATES NEWSLETTER

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## PYOTHORAX

By Dr. Rachel Morgan, DVM (Practice limited to E/CC) | Emergency and Critical Care

Pyothorax, also known as thoracic empyema, is defined as the accumulation of septic purulent exudate within the pleural space. Sources of bacteria responsible for the development of pyothorax are numerous and can include pneumonia, lung abscess, thoracic bite wounds, and aberrant migration of parasites or grass awns—see Table 1 (Waddell et al 2002, Scott et al 2003). Etiologies such as migration of inhaled foreign bodies and penetration of the thorax are more common in dogs. The cause of pyothorax in many cases is not identified despite advanced imaging or exploratory thoracotomy, and understanding of the proposed etiology and pathophysiology remains controversial (Stillion et al 2015). While thoracic bite wounds have traditionally been proposed as a frequent cause of pyothorax in both feline and canine patients, evidence of an external wound or a visualized altercation is frequently absent. There has been recent thought that the underlying etiology may be secondary to an underlying pulmonary infection or aspiration of bacteria from the oropharynx (Stillion et al 2015, Anastasio 2012).

### CLINICAL SIGNS

In dogs, pyothorax more commonly occurs at a mean age of 3-4 years, though there are rare case reports of occurrence in neonates (Gulbahar et al

2002). Some retrospective case reports indicate that males are overrepresented, while others do not report any sex predilection. In canine patients, medium to large breeds, and hunting and working type dogs are often overrepresented. The majority of patients present with clinical signs related to the presence of pleural effusion, including dyspnea, exercise intolerance, anorexia, weight loss and lethargy. Other reported signs include cough, polydipsia, and reluctance to lie down. Physical exam findings may include fever, dehydration, depression and dyspnea.

### DIAGNOSTICS

Cytology, culture, and sensitivity should be performed on samples of thoracic fluid in order to assess the total protein and nucleated cell counts as well as confirm the presence of an exudate and to rule out other causes of exudative pleural diseases such as chylothorax, hemothorax and bilothorax.

The diagnosis of septic suppurative effusion is based on the presence of intracellular organisms on cytologic examination. Culture and sensitivity can help to guide antimicrobial therapy, and both anaerobic and aerobic cultures should be considered given that anaerobic bacteria are a common component of infection (Boothe et al



Dr. Rachel Morgan

### TABLE 1: CAUSES OF PYOTHORAX IN DOGS AND CATS

- Pneumonia
- Lung abscess
- Thoracic bite wounds
- Dissemination via hematogenous or lymphatic pathways
- Aberrant migration of parasites or grass awns
- Lung parasites
- Diskospondylitis
- Neoplasia with abscess formation
- Esophageal or tracheal perforation

(Waddell et al 2002, Scott et al 2003)

**TABLE 2: FLUID CHARACTERISTICS**

Effusion Type	Classic Parameters
Pure Transudate	TP > 2.5 g/dl TNCC < 1500/ $\mu$ l
Modified Transudate	TP > 2.5 to 7.5 g/dl TNCC > 1000 to 7000/ $\mu$ l
Exudate	TP > 3.0 g/dl TNCC > 7000/ $\mu$ l

(Zoia et al 2009)

2010, Walker et al 2000). The presence of multiple concurrent organisms in cases of pyothorax infections are not uncommon, and the types of bacteria isolated tends to differ between feline and canine patients (Waddell et al 2002, Walker et al 2000, Rooney et al 2002). In cats, nonenteric bacteria such as *Pasteurella* spp are more commonly isolated, whereas in dogs, members of the Enterobacteriaceae family such as *Escherichia coli* are more prevalent (Walker et al 2000). Anaerobic species such as *Actinomyces* and *Nocardia* have also been more commonly associated with intrathoracic pyogranulomatous infections in canine patients.

After thoracocentesis and stabilization, three view thoracic radiographs can be performed in order to rule out the presence of obvious neoplasia or evidence of additional, potentially related pulmonary pathology. A thoracic CT scan can be considered if there is suspicion of migrating foreign bodies, with some studies suggesting a strong correlation between surgical and CT findings (Swinbourne et al 2011). A 2016 retrospective case series by Caivano et al. suggests that transthoracic or transesophageal ultrasonography may be useful in the identification of migrating foreign objects such as grass awns. Definitive identification of the source of pyothorax can be extremely difficult, and some studies report that the cause is identified in only 2-22% of canine patients with pyothorax and 35-67% in feline patient (Boothe et al 2010, Demetriou et al 2002, Rooney et al 2002).

## TREATMENT

Controversy regarding recommendations for medical vs surgical management of pyothorax in human and veterinary patients persists. In veterinary medicine, there is no consensus statement and few evidence-based guidelines regarding surgical vs. medical therapy, but medical therapy is typically accepted as the most common approach. Generally, medical management via hospitalization, thoracostomy tube placement, thoracic lavage and initiation of broad spectrum intravenous antibiotics along with supportive care is recommended pending the results of culture and susceptibility testing. Traditionally, antibiotics such as enrofloxacin and ampicillin with sulbactam or ticarcillin with clavulanate have been chosen for their respective efficacy against gram-negative bacteria and gram-positive and anaerobic infections. However, growing resistance of *E.coli* to enrofloxacin specifically has been an increasing concern (Walker et al 2000, Stillion 2015). Clindamycin is frequently chosen as an initial antibiotic in feline patients with pyothorax due to its potentially efficacy against organisms more commonly isolated in that population. The recommended duration of antimicrobial therapy for veterinary patients with pyothorax is controversial and typically extrapolated from guidelines created for human patients, such as those created by the British Thoracic Society, which dictate a minimum of 3 weeks of oral antimicrobial therapy following discharge. In veterinary medicine, protocols are often clinician dependent, but typically continuing antibiotics for two weeks beyond resolution of radiographic signs is recommended (Epstein 2014). Mean duration of antimicrobial therapy

reported in veterinary patients was 5-7 weeks in several studies on cats with pyothorax (Demetriou et al 2002, Barrs et al 2005).

Antimicrobial therapy alone is generally considered inadequate due to the inability to effectively eliminate the septic focus. Thoracostomy tube placement (as opposed to intermittent thoracocentesis) is recommended in order to more efficiently evacuate the source of infection and to avoid the increased risk of mortality associated with repeated thoracocentesis has been documented (Anastasio 2012, Johnson et al 2007). Needle thoracocentesis should be reserved for initial stabilization of unstable patients. Bilateral thoracostomy tubes are required in most cases. Whereas previous techniques for thoracostomy tube placement relied on the use of either blunt dissection or trocars, now placement of smaller bore wire-guided tubes via a modified Seldinger technique would be the preferred technique. Selection of thoracostomy tube type and size for treatment of pyothorax is not without controversy in veterinary medicine, with some clinicians preferring the traditional larger bore thoracostomy tubes due to the concern that the smaller bore may not provide adequate drainage with thicker, fibrinous exudates, while others prefer small-bore thoracostomy tubes as they are easier to place, have decreased complication rates and cause less discomfort for the patient after placement (Epstein 2014, Barrs et al 2009, Vatolina et al 2009). Unfortunately, extensive studies comparing the efficacy of large and small bore thoracostomy tubes in the drainage of exudates have not been performed, though a handful have attempted to gain more information.

A 2009 study of twenty animals found that the small-bore thoracostomy tubes were an effective alternative to large-bore tubes (Vatolina et al 2009). A 2017 study demonstrated that both small and large bore chest tubes were equally effective at removing both low and high viscosity fluids from the pleural spaces of cadavers (Fetzer et al 2017).

The effusion in most cases is thick and many clinicians routinely utilize periodic lavage with sterile, warm 0.9% NaCl at a dose of 10 ml/kg q 6-12 hours in order to aid with evacuation (Epstein 2014, Sauve 2014). However, there are no evidence-based guidelines regarding the specific type, amount, and frequency of lavage solutions in veterinary medicine. Potential complications of thoracic lavage include volume overload, introduction of nosocomial infections, and rarely, electrolyte derangements (Stillion et al 2015, Waddell et al 2002, Barrs et al 2005). Currently, intrapleural infusion of antimicrobials, anticoagulants or fibrinolytics have not been evaluated extensively in veterinary patients, and therefore their use cannot be recommended at this time (Stillion et al 2015, Boothe et al 2010, Rahmman et al 2011, Zhu et al 2006).

When instituting medical management for pyothorax, most patients require treatment as described above for 4-6 days. The decision to remove thoracostomy tubes is typically based on a combination of decreasing fluid production, decreasing incidence of intracellular bacteria, and the character of the effusion. If responding to medical management, the effusion will become less suppurative, and the volume that is accumulating per day should gradually decrease (some recommendations for thoracostomy tube removal dictate that fluid production should be less than 2.2 ml/kg per tube in a 24 hour period, though sterile pleuritis that can develop can also contribute to the development of effusion and should be taken into consideration when monitoring trends) (Demetriou et al 2002). Further monitoring of trends in thoracic effusion and efficacy of drainage can be facilitated via daily

ultrasonographic examination using the T-FAST or VetBlue protocol versus serial thoracic radiographs.

In cases in which the patient is either failing medical management or there is strong suspicion of an abscess within the lung or pleural space, evidence of a migrating intrathoracic foreign body, esophageal perforation or neoplasia, an exploratory thoracotomy should be pursued. Alternative options that may become more extensively used in the coming years include video-assisted thoracoscopic surgery (VATS), which may allow exploration of the thorax in a less invasive manner, though complications such as pneumothorax, extensive pleural adhesions and hemorrhage may require conversion to a traditional open thoracotomy (Radlinsky 2009, Stillion et al 2015).

## PROGNOSIS

Overall survival rate in small animals with pyothorax has been generally estimated at 63% to 66.1%. Some retrospective studies have estimated success rates in cats treated with thoracostomy tubes to be as high as 95% (Barrs et al 2005). Requirement of surgical exploration has not statistically been associated with a worse outcome based on several studies (Waddell et al 2002, Boothe et al 2010).

## CONCLUSION

Pyothorax in small animals is a life threatening and potentially frustrating condition affecting the pleural space and potentially resulting in systemic illness and organ dysfunction secondary to sepsis. The etiology is poorly understood and can differ between dogs and cats. Definitive identification of a source of infection is frequently not achieved despite extensive diagnostics. However, the prognosis for patients can be favorable, and though hospitalization, supportive care, thoracostomy tube placement and thoracic lavage are typically required, surgery may potentially be avoided if there is a favorable response to medical management. 🐾

*See references on back page.*

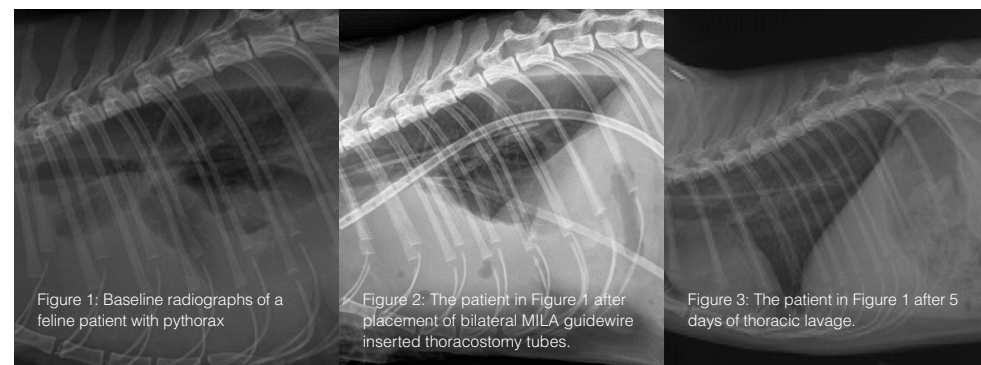


Figure 1: Baseline radiographs of a feline patient with pyothorax

Figure 2: The patient in Figure 1 after placement of bilateral MILA guidewire inserted thoracostomy tubes.

Figure 3: The patient in Figure 1 after 5 days of thoracic lavage.

# SPECIALIZED SERVICES

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## PET LOSS SUPPORT GROUP

Here, we all understand the depth of loss one experiences when a beloved four-legged family member has passed. For that reason, Metropolitan provides a Pet Loss Support Group to help grieving owners in need. Our pet group is designed to provide grieving pet parents with a safe, confidential environment to share their feelings with others who have experienced pet loss.

The group is operated by vets and veterinary nurses who have experience with pet loss. A board certified psychiatrist consults with us regarding the implementation of the group, however, our group leaders are not mental health care professionals. Clients experiencing difficulty coping are urged to seek help from a mental healthcare professional. We can provide you with the names of health care professionals if needed. Our Pet Loss Support Group meets on a varying schedule.

For dates please call the hospital at 610.666.1050 or visit [metro-vet.com/petloss](http://metro-vet.com/petloss).



## UPCOMING CONTINUING EDUCATION EVENTS

WEDNESDAY, APRIL 25TH

### The Facts About Cataracts...and Other Disease of the Canine Lens

**Where:** Pomme | 175 King of Prussia Road | Radnor

**Registration and Dinner:** 6:30 to 7:00pm

**Presentation:** 7:00 to 9:00pm

**Credits:** 2 Race CE Credits

**Speaker:** Dr. Amanda Corr, VMD, DACVO

This presentation will include a brief review of canine ocular anatomy, specifically the lens, and pathophysiology of cataract formation. We will discuss the different types and stages of cataracts and complications associated with cataract development. Methods for determining who is a good candidate for cataract surgery, the surgical procedure itself (phacoemulsification), success rates and complications will be covered. Finally, we will review other common diseases of the canine lens such as lens luxation.

SUNDAY, MAY 20TH

### Companioning Grieving Clients

**Where:** John James Audubon Center | 1201 Pawlings Road | Audubon

**Registration and Lunch:** 12:30 to 1:00pm

**Presentation:** 1:00 to 3:00pm

**Credits:** 2 PVMA Credits (Pending)

**Speaker:** Stephanie Belak MSW, LSW (*Day By Day Pet CareGiver Support*)

As veterinary professionals, our clients need both our expert medical guidance and our steadfast emotional support when they are facing end-of-life caregiving, decision-making, death, and life after the loss of their beloved pet. With a focus on Dr. Alan Wolfelt's "Companioning Model," this seminar will discuss the six essential needs of a mourning pet owner and tips and tools on comforting a client after the loss of a beloved pet. Led by Kathryn M. Jennings, who holds multiple certifications in Pet Loss and Grief Studies and is the founder of Day by Day - a non-profit organization that offers compassionate support to caregivers of aging, chronic, and terminally ill pets.

FOR MORE INFORMATION AND TO REGISTER VISIT [METRO-VET.COM/CE](http://METRO-VET.COM/CE)



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