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LECTURE TITLE: PLEURAL EFFUSIONS: PRACTICAL AND EVIDENCE-BASED DECISION-MAKING IN FIRST OPINION AND REFERRAL CLINICS

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INTRODUCTION

Pleural effusions, defined as the accumulation of fluid within the pleural space, represent a clinically significant and often urgent problem in small animal veterinary medicine. Dogs and cats presenting with respiratory distress secondary to pleural effusion require prompt stabilization and a logical diagnostic approach. This lecture provides a practical and evidence-based review suitable for both general practitioners and referral clinicians, addressing the clinical spectrum from first opinion to advanced surgical intervention. Emphasis is placed on real-world decision-making and the latest veterinary literature.

EPIDEMIOLOGY

Pleural effusion is more common in cats than in dogs, though etiological patterns differ by species. In cats, pyothorax and feline infectious peritonitis (FIP) are frequently identified. In dogs, chylothorax, trauma, and foreign body migration dominate the differential list. Breed predispositions are notable: Afghan Hounds and Shiba Inus for idiopathic chylothorax.

PLEURAL ANATOMY AND PHYSIOLOGY

The pleural cavity is a potential space lined by visceral and parietal pleura, normally containing a small volume of lubricating fluid. This fluid is produced by mesothelial cells and is absorbed via the lymphatic stomata in the parietal pleura. Starling forces, lymphatic drainage, and mesothelial permeability maintain fluid balance. Disturbance in any of these components results in effusion accumulation. The pleural space is subdivided into right and left compartments, which can allow for unilateral or bilateral effusions depending on the underlying pathology.

PATHOPHYSIOLOGY AND CLASSIFICATION

Pleural effusions are typically classified into five types based on fluid analysis:

- Transudates
  - Low protein content (<25 g/L)
  - Low nucleated cell count (<1,500/µL)
  - Often secondary to hypoalbuminemia or systemic conditions that reduce oncotic pressure
- Modified Transudates
  - Moderate protein concentrations (25–30 g/L)
  - Moderate cellularity
  - Associated with chronic inflammatory or obstructive diseases
- Exudates
  - High protein content (>30 g/L)
  - High nucleated cell count (>5,000/µL)
  - Indicate infection, inflammation, or immune-mediated processes
- Chylous Effusions
  - Milky appearance
  - Rich in triglycerides (pleural fluid triglyceride > serum triglyceride confirms diagnosis)
  - Result from thoracic duct rupture, lymphatic obstruction, or idiopathic mechanisms
- Hemorrhagic Effusions
  - Non-clotting, blood-tinged fluid

- Cytology shows erythrophagocytosis and absence of platelets if chronic
- Common causes include trauma and coagulopathies

CLINICAL SIGNS AND INITIAL ASSESSMENT

Patients with pleural effusion often present with dyspnoea, tachypnoea, orthopnoea, and decreased thoracic excursion. Physical examination may reveal muffled heart and lung sounds and increased respiratory effort. Thoracocentesis is both diagnostic and therapeutic and should be prioritized in unstable patients.

LABORATORY DIAGNOSIS

Laboratory analysis of pleural fluid is essential for characterizing the effusion and identifying its etiology:

1. Fluid Analysis:

- Gross appearance: Milky (chylous), turbid (infectious), or hemorrhagic
- Total protein concentration: Differentiates transudates (<25 g/L), modified transudates (25–30 g/L), and exudates (>30 g/L)
- Total nucleated cell count (TNCC): Exudates typically >5,000 cells/µL
- Cytology: Detects neutrophilic inflammation (pyothorax), lymphocytes (chylothorax), or infectious organisms

2. Biochemistry:

- Triglycerides: Pleural fluid > serum = chylothorax
- Cholesterol/triglyceride ratio: <1.0 supports chylous effusion
- Glucose: Low in septic effusions
- Lactate: Elevated in bacterial infections
- pH: <7.2 may indicate infection

3. Microbiology:

- Aerobic/anaerobic culture of pleural fluid for pyothorax
- Broad-range 16S PCR may identify uncultivable organisms

4. Hematology and Serum Biochemistry:

- Leukocytosis and toxic changes suggest sepsis
- Hypoalbuminemia may be present with transudative processes

DIAGNOSTIC IMAGING

Thoracic radiographs are often limited pre-thoracocentesis but may reveal widened interlobar fissures, scalloped lung lobes, or mediastinal shift. Post-thoracocentesis radiographs help evaluate lung pathology and rule out masses or foreign bodies.

Ultrasound is highly sensitive in detecting pleural effusion and can guide thoracocentesis. Echogenic swirling or septations suggest pyothorax.

CT is valuable in identifying underlying causes such as lung lobe torsion, abscessation, or thoracic duct anatomy. CT lymphangiography or positive contrast lymphangiography enhances thoracic duct visualization pre-surgery.

SURGICAL MANAGEMENT

Surgical intervention is indicated in cases of refractory effusion, failed medical management, or where an underlying condition such as foreign body, necrotic lung lobe, or idiopathic chylothorax is identified. For pyothorax, median sternotomy allows complete exploration of the thoracic cavity, identification and resection of diseased tissue, removal of foreign material, and placement of thoracostomy tubes. Lavage of the pleural cavity intraoperatively is essential.

For chylothorax, thoracic duct ligation combined with pericardiectomy is considered the surgical gold standard. Cisterna chyli ablation and omentalisation have been used as adjunct procedures to improve outcomes. Fluorescein-enhanced near-infrared imaging can be employed intraoperatively to confirm duct location and successful ligation. Thoracoscopy offers a minimally invasive approach with comparable outcomes to thoracotomy in selected cases, particularly for pericardiectomy and thoracic

duct ligation.

POSTOPERATIVE CARE

Postoperative management in patients with pleural effusion—especially those undergoing thoracotomy or thoracoscopy—requires meticulous supportive care. Thoracostomy tubes should remain in place until fluid production decreases and cytology indicates resolution of inflammation. Analgesia is critical and should include multimodal pain management (e.g., opioids, local blocks, NSAIDs if tolerated). Oxygen therapy, intravenous fluids, nutritional support, and monitoring for signs of respiratory compromise are essential. Chest tube patency should be checked regularly, and sterile technique maintained during drainage or flushing.

Antibiotic therapy in pyothorax is continued for at least 4–6 weeks based on culture and sensitivity, and repeat imaging (ultrasound or radiography) is used to guide duration. Postoperative complications to monitor include pneumothorax, re-accumulation of effusion, infection, and tube obstruction.

Cats in particular require close attention to stress reduction, hypothermia prevention, and supportive feeding (e.g., nasoesophageal or esophagostomy tubes).

PROGNOSIS AND OUTCOME

Pyothorax: Medical management using thoracic drainage and lavage has shown variable outcomes. In dogs, reported survival rates range from 65–75% with tube drainage and antibiotics, while cats treated medically have survival rates of 40–60%. Surgical management in both species, particularly via median sternotomy with debridement and lavage, improves long-term outcomes. One study reported an 85% survival to discharge rate in cats undergoing surgery after failed medical therapy. Long-term recurrence is uncommon if adequate source control is achieved.

Chylothorax: The prognosis for idiopathic chylothorax varies by treatment modality. Conservative therapy (low-fat diet, rutin, intermittent thoracocentesis) has a low success rate (<25%). Surgical management combining thoracic duct ligation and pericardiectomy offers the highest resolution rates—up to 80% in recent studies. Adjunctive cisterna chyli ablation and omentalisation may improve outcomes. Cats tend to have a better surgical prognosis than dogs, with fewer long-term complications like fibrosing pleuritis.

COMPLICATIONS

Postoperative complications include pneumothorax, hemorrhage, infection, persistent air leakage, chylous leakage, and recurrence. Thoracic duct ligation may fail if collateral ducts are missed. Fibrosing pleuritis may limit lung re-expansion despite effusion resolution. Cats are prone to anorexia and hepatic lipidosis postoperatively, necessitating early nutritional support.

CONCLUSION

Pleural effusion in small animals represents a diagnostic and therapeutic challenge requiring a structured, evidence-based approach. Early recognition, accurate fluid analysis, and targeted diagnostics are fundamental for identifying the underlying cause. While medical management may suffice in select cases, surgical intervention offers improved outcomes for refractory or structurally-driven effusions such as chylothorax and pyothorax. Advances in thoracoscopy, intraoperative imaging, and adjunctive techniques such as cisterna chyli ablation and omentalisation have expanded therapeutic options. Prognosis is closely tied to timely intervention, underlying etiology, and perioperative care. An informed, case-by-case approach integrating clinical stability, diagnostics, and surgical indication optimizes patient outcomes in both first opinion and referral settings.

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