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CLINICAL MANAGEMENT OF PYOTHORAX IN CATS: DIAGNOSTIC AND THERAPEUTIC CONSIDERATIONS

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Abstract

Pyothorax, also termed empyema, is defined as the accumulation of purulent septic exudate within the pleural cavity and represents one of the most severe pleural diseases in cats. The condition may arise from thoracic bite wounds, penetrating trauma, extension of pulmonary infection, or other sources of pleural contamination. Affected patients commonly present with dyspnea, lethargy, fever, and systemic illness. Thoracentesis is both a diagnostic and therapeutic procedure, allowing confirmation of septic pleural effusion and immediate relief of respiratory distress. Cytologic evaluation typically reveals degenerate neutrophils with intracellular bacteria. Successful management requires aggressive pleural drainage through thoracostomy tubes combined with repeated pleural lavage and systemic broad-spectrum antimicrobial therapy. When clinical improvement is not achieved within 48-72 hours, surgical exploration may be required to eliminate persistent infectious foci or non-functional pulmonary tissue. Early recognition and decisive management are essential, as delayed treatment may result in pleural fibrosis and irreversible fibrothorax.

Key words*: pyothorax, pleural effusion, fibrosis, fibrothorax, cats.*

INTRODUCTION

Pyothorax, also referred to as empyema, represents the accumulation of purulent septic exudate within the pleural cavity and is considered one of the most severe pleural diseases encountered in feline patients. The condition results from bacterial contamination of the pleural space and may develop secondary to thoracic bite wounds, penetrating trauma, pulmonary infections, or other sources of pleural contamination. In cats, pyothorax frequently presents with acute respiratory distress, lethargy, fever, anorexia, and systemic illness, reflecting both respiratory compromise and systemic inflammatory response.

Feline pyothorax typically presents as a life-threatening pleural infection characterized by accumulation of septic exudate within the pleural cavity, leading to respiratory compromise and systemic inflammatory response. This infected pleural fluid interferes with normal lung expansion and leads to restrictive respiratory dysfunction. Accumulation of septic exudate within the pleural cavity may rapidly result in dyspnea and hypoxemia, requiring immediate diagnostic and therapeutic intervention. Thoracentesis remains a fundamental procedure for both diagnosis and initial stabilization, allowing removal of pleural fluid while providing samples for cytological and microbiological evaluation. Cytological examination typically reveals degenerate neutrophils and intracellular bacteria, confirming the septic nature of the effusion (Tobias & Johnston, 2017; Fossum, 2018).

Successful treatment of feline pyothorax relies on aggressive evacuation of infected pleural fluid through chest tube placement combined with repeated pleural lavage and systemic broad-spectrum antimicrobial therapy (Monnet, 2018).

Adequate pleural drainage plays a critical role in controlling infection, improving pulmonary expansion, and preventing further pleural inflammation.

However, in some cases medical management may fail due to persistent infection, fibrin deposition, or the development of pleural loculations that limit effective drainage. Progressive organization of pleural exudate may lead to pleural thickening and lung entrapment, eventually resulting in fibrothorax. In this advanced stage, restrictive pleural fibrosis may significantly impair lung expansion and worsen prognosis (Fossum, 2018). Early recognition of

treatment failure and timely clinical decision-making are therefore essential components in the management of this condition.
The aim of this paper is to present the diagnostic and therapeutic considerations involved in the clinical management of feline pyothorax, emphasizing early pleural drainage, structured reassessment of clinical response, timely surgical intervention when required, and the prevention of fibrothorax.

MATERIALS AND METHODS

This study presents the clinical management of feline patients diagnosed with pyothorax and treated at the "Prof. univ. dr. Alin Bîrţoiu" University Veterinary Emergency Hospital, Faculty of Veterinary Medicine Bucharest.
Diagnosis of pyothorax was established through a combination of clinical examination, thoracic imaging and analysis of pleural fluid obtained by thoracocentesis. Initial diagnostic evaluation included thoracic radiography and ultrasonography to confirm the presence of pleural effusion and assess lung expansion. In selected cases, computed tomography (CT) was performed to further evaluate the extent of pleural disease and identify possible underlying causes such as pulmonary abscesses, foreign bodies or localized pulmonary lesions.
Initial stabilization focused on restoration of respiratory function and hemodynamic stability. Oxygen supplementation was provided, and analgesia was administered to improve patient comfort and reduce respiratory compromise associated with thoracic pain. Diagnostic thoracocentesis was performed in all patients to confirm septic pleural effusion and to achieve immediate decompression of the thoracic cavity. Following confirmation of pyothorax by macroscopic examination of pleural fluid and rapid cytological assessment, thoracic drainage was established using chest tubes to allow continuous evacuation of purulent pleural fluid. Bilateral drainage was performed when pleural effusion was present in both hemithoraces. Thoracic lavage with sterile warmed isotonic fluids, such as Ringer's solution, was initiated to facilitate removal of inflammatory debris and bacterial contamination from the pleural space. Systemic antibiotics were administered intravenously and initially selected based on cytological findings, later adjusted according to bacterial culture and antimicrobial susceptibility testing when available.
Clinical progression was monitored through repeated physical examinations, assessment of respiratory function, and evaluation of drainage characteristics. Particular attention was given to the response during the first 48-72 hours of treatment, as failure to demonstrate clinical improvement within this period raised concern for persistent infection, pleural loculation or development of restrictive pleural disease.
Surgical intervention was considered in patients that failed to respond to conservative management, in cases with persistent pleural infection despite adequate drainage, or when imaging findings suggested the presence of pulmonary lesions requiring surgical exploration. Surgical procedures were performed through thoracotomy in order to allow debridement of infected tissue, exploration of the pleural cavity, and lung lobectomy when necessary. Follow-up evaluation included clinical reassessment and thoracic imaging to monitor lung re-expansion and detect possible complications such as pleural fibrosis or fibrothorax.

RESULTS AND DISCUSSIONS

Pleural Fluid Characteristics

Pleural fluid obtained from affected cats is typically turbid to purulent in appearance and consistent with septic exudate. In severe cases, the fluid contains a high burden of inflammatory cells, fibrinous material and necrotic debris, reflecting the intensity of pleural inflammation and bacterial contamination (Figure 1).

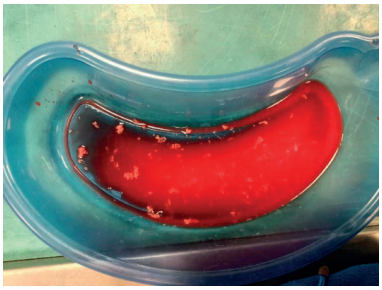


Figure 1. Gross appearance of pleural fluid obtained by thoracocentesis showing turbid reddish exudate with fibrinous debris consistent with septic pleural effusion (original Dr. Uzun, FMVB)

Cytological evaluation of the pleural fluid demonstrates septic exudate characterized predominantly by degenerated neutrophils and abundant bacterial organisms. Numerous bacteria are observed both free within the background and intracellularly within neutrophils, consistent with active bacterial phagocytosis. The smear also contains cellular debris and inflammatory material typical of severe pleural infection (Figure 2).

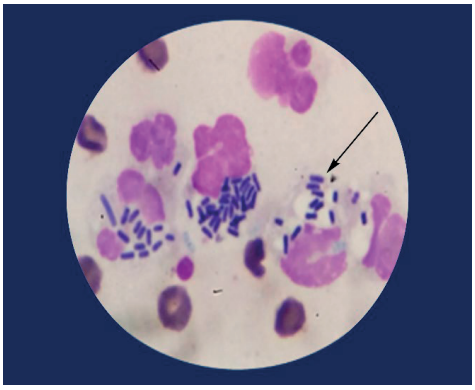


Figure 2. Thoracocentesis fluid cytology (MGG Quick stain, 1000×) demonstrating septic exudate characterized by degenerated neutrophils with intracellular bacteria consistent with bacterial phagocytosis
(Modified from Uzun S., Veteriner Tıp Acil Prosedürleri).

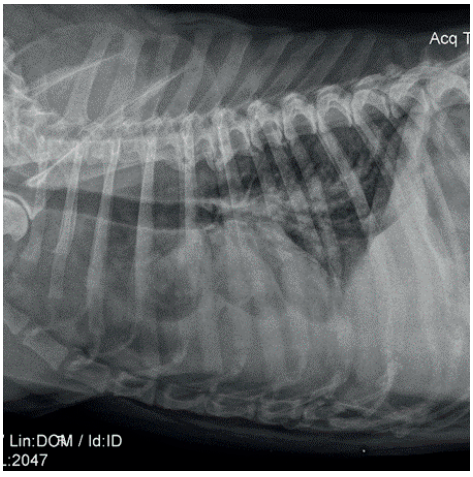


Figure 3. Right lateral thoracic radiograph of a cat with pyothorax. There is marked pleural effusion causing retraction of the lung lobes away from the thoracic wall, widened interlobar fissure lines, and obscuration of the cardiac silhouette and diaphragm. The overall "soft tissue opacity" pattern is typical of large-volume pleural fluid accumulation
(original radiology department FMVB)

Thoracic Radiography

Thoracic radiography reveals pleural effusion, fissure lines, lung lobe retraction, and loss of cardiac silhouette. However, in severe effusion, radiographs may only show a "white thorax" with limited detail (Figure 3).

Pleural Drainage and Thoracic Lavage

Following confirmation of pyothorax, chest tubes are placed in order to establish continuous drainage of the infected pleural fluid. Bilateral drainage is required in patients with fluid accumulation affecting both hemithoraces. Continuous evacuation of purulent pleural effusion improves lung expansion and facilitates subsequent pleural lavage.

Drainage characteristics are monitored closely during hospitalization, with particular attention to the volume, consistency and persistence of pleural exudate. In patients responding favorably to treatment, progressive reduction in drainage volume and improvement in respiratory pattern are observed (Figure 4).



Figure 4. Cat with pyothorax on the second day after chest tube placement. The patient shows improved comfort and respiratory stability following the third thoracic lavage (original Dr. Uzun, FMVB)

Thoracic lavage with sterile warmed isotonic fluids, such as sterile warmed Ringer's solution, was initiated to facilitate removal of inflammatory debris and bacterial contamination from the pleural space, in order to facilitate removal of purulent exudate, fibrinous material and cellular detritus from the pleural cavity. Repeated lavage improves clearance of the infected pleural space and enhances the effectiveness of chest tube drainage.

In cases with early therapeutic response, lavage contributes to progressive reduction of pleural contamination and improves lung re-expansion.

However, in more advanced disease, persistent fibrin deposition and pleural loculation limit the efficacy of lavage alone.

Surgical Management

Surgical intervention becomes necessary in patients that fail to respond adequately to pleural drainage and thoracic lavage or in cases where advanced pulmonary pathology and restrictive pleural changes are present. Additionally, patients that initially respond to medical management may subsequently develop recurrence of pyothorax over time. Operative treatment allows direct access to the pleural cavity for evacuation of purulent material, removal of fibrinous debris, disruption of pleural loculations and extensive lavage of the infected thoracic space. In addition, surgical exploration permits direct evaluation of pulmonary structures and identification of underlying lesions that may perpetuate infection.

In selected cases, pulmonary lesions require lung lobectomy in order to eliminate the primary source of infection and restore thoracic function. Severely affected lung lobes may demonstrate necrosis, abscessation or irreversible parenchymal destruction, making preservation impossible. Surgical resection of the diseased lung tissue, combined with thorough debridement of the pleural cavity and lavage, contributes to resolution of infection and facilitates re-expansion of the remaining pulmonary parenchyma (Figure 5).

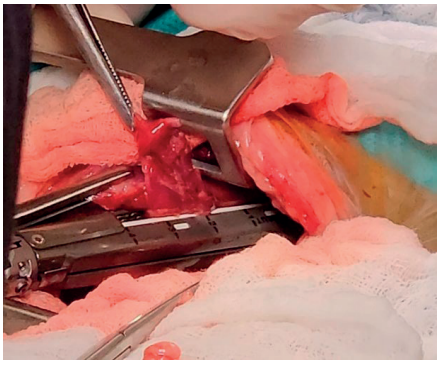


Figure 5. Intraoperative view during thoracic surgery showing lung lobectomy performed to remove severely diseased pulmonary tissue associated with pyothorax (original Dr. Uzun, FMVB)

In chronic or delayed cases, progressive pleural fibrosis may lead to fibrothorax, characterized by thick fibrous pleural membranes that severely restrict lung expansion. Intraoperatively, these patients demonstrate marked pleural thickening and lung entrapment, often preventing normal pulmonary re-expansion even after evacuation of infected material (Figure 6).

The development of fibrothorax represents one of the most severe complications of feline pyothorax and significantly limits the potential for complete pulmonary re-expansion. Once dense fibrous pleural membranes have formed, even aggressive surgical intervention may fail to restore normal lung function. These findings emphasize the importance of early diagnosis, rapid pleural drainage, and close monitoring of treatment response in order to prevent progression toward irreversible pleural organization.

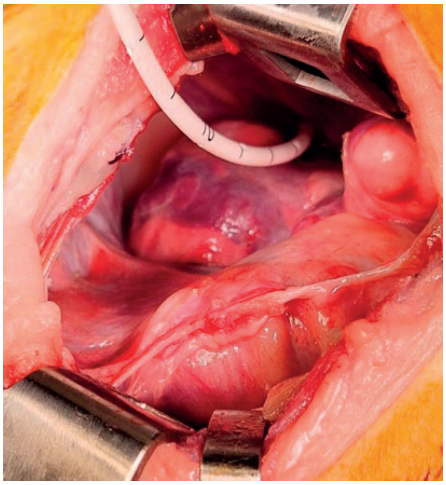


Figure 6. Intraoperative appearance of severely fibrotic lung lobes showing marked restriction of lung expansion consistent with fibrothorax and lung entrapment (original Dr. Uzun, FMVB)

Based on the clinical observations and therapeutic responses observed in these cases, a clinical decision-making algorithm was developed to assist in the diagnostic evaluation and management of pleural effusions and feline pyothorax (Figure 7).

Pyothorax represents a severe infectious process within the pleural cavity characterized by accumulation of purulent exudate, bacterial contamination, and progressive inflammatory changes affecting the pleural membranes. In cats, the condition may develop rapidly and commonly presents with respiratory distress, lethargy, and systemic inflammatory response.

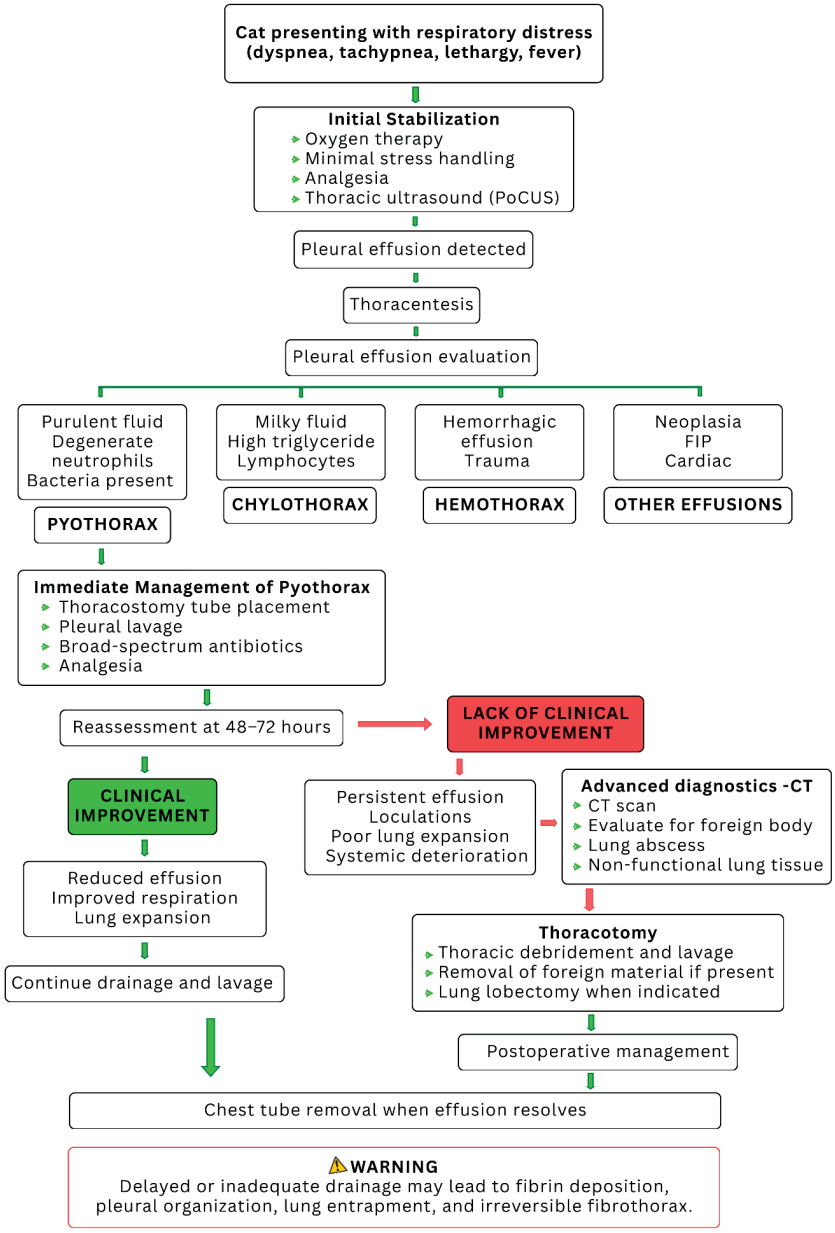


Figure 7. Clinical decision-making algorithm for the diagnostic evaluation and management of pleural effusions and feline pyothorax. The flowchart summarizes the stepwise clinical approach from initial stabilization and pleural fluid classification to medical management and indications for surgical intervention in cats with suspected pyothorax

Early recognition and prompt evacuation of infected pleural fluid are critical components of successful management. Delayed or inadequate drainage allows ongoing pleural inflammation, leading to fibrin deposition, pleural organization, and formation of loculations that interfere with effective drainage and lung re-expansion. Progressive pleural fibrosis may ultimately result in lung entrapment and irreversible fibrothorax, substantially

complicating clinical management and reducing the likelihood of successful conservative therapy (Fossum, 2018).

Effective treatment of pyothorax relies on rapid evacuation of infected pleural fluid, adequate drainage, and appropriate antimicrobial therapy. Thoracostomy tube placement enables continuous drainage of purulent material and facilitates repeated pleural lavage, which helps reduce bacterial load and remove inflammatory debris from the pleural cavity (Fossum, 2018). Early intervention is therefore essential to prevent progressive fibrin deposition and organization within the pleural space, allowing restoration of normal pulmonary expansion. Previous reports have shown that many feline pyothorax cases can be successfully managed with medical therapy when effective drainage and lavage are instituted promptly and combined with appropriate systemic antibiotic treatment (Monnet, 2018).

Surgical exploration should be considered in cases demonstrating persistent pleural effusion, formation of pleural loculations, poor pulmonary re-expansion, or systemic deterioration despite appropriate medical management. Progressive fibrin deposition and compartmentalization of purulent material may prevent effective drainage and lavage, limiting the success of conservative treatment approaches (Fossum, 2018; Johnston & Tobias, 2017). Advanced imaging, particularly computed tomography, may assist in identifying underlying causes such as foreign bodies, pulmonary abscesses, or non-functional pulmonary tissue. Thoracotomy allows direct removal of fibrinous debris, breakdown of loculations, and elimination of infectious sources, including pulmonary lobectomy when severely diseased lung tissue is present (Monnet, 2018; Fossum, 2018).

Pyothorax should be considered a time-sensitive thoracic emergency rather than a condition that allows prolonged therapeutic hesitation. Delayed or insufficient drainage permits rapid progression of pleural inflammation, fibrin deposition, and formation of pleural loculations, ultimately leading to lung entrapment and fibrothorax. Once this stage develops, conservative therapy becomes increasingly ineffective and surgical intervention may represent the only remaining option for survival (Fossum, 2018; Johnston & Tobias, 2017). Clinicians managing feline pyothorax should therefore closely monitor response to treatment and avoid prolonged medical management when clinical improvement is not evident. Early recognition of treatment failure and timely surgical consultation may be decisive in preventing irreversible pleural disease and improving patient outcome.

CONCLUSIONS

Feline pyothorax represents a severe pleural infection requiring rapid recognition and decisive clinical management.

Successful treatment depends on prompt evacuation of infected pleural fluid, effective drainage, and appropriate antimicrobial therapy. Delayed or inadequate treatment may allow progression of pleural inflammation, fibrin deposition, and loculation formation, ultimately resulting in lung entrapment and fibrothorax. Recognizing when medical therapy has failed and surgical management is required may be the most critical decision in the treatment of feline pyothorax.

REFERENCES

De Troyer A., Leduc D., Cappello M., Gevenois P.A. (2012). Mechanics of the canine diaphragm in pleural effusion. *J Appl Physiol*., 113(5): 785–90.

Fossum T.W. (2018). *Small Animal Surgery*. 5th ed. St. Louis: Elsevier; p. 889–94.

Johnston S.A. & Tobias K.M. (2017). *Veterinary Surgery: Small Animal Expert Consult*.

Monnet E. (2018). Pleural Effusions. In: *Small Animal Thoracic Surgery*, First Edition. E. Christopher Orton and Eric Monnet. John Wiley & Sons, Inc. p. 77–87.

Monnet E. (2004). Pleural Effusions. In: *Proceedings of the 29th WSAVA World Congress*.

Padrid P. (2000). Canine and feline pleural disease. *Vet Clin North Am Small Anim Pract*. Nov., 30(6): 1295–307.

Rebar A.H. (2009). Cytology of effusions. In: *NAVC Clinician's Brief Proceedings*. DVM360. August 1.

Waddell L.S. (2019). Pleural effusion. In: Drobatz K., Hopper K., Rozanski E., Silverstein D., editors. *Textbook of Small Animal Emergency Medicine*. Hoboken: Wiley; p. 285–90