Tap That: Managing Effusions in The Dyspnoeic Patient

Presenters:

Yvonne McGrotty & Chiara Piccinelli

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Disclosures:

Yvonne McGrotty
- Employee of IDEXX
- Employee of AniCura France

Chiara Piccinelli
- Employee of IDEXX

Dyspnoea

- Inspiratory
  - Upper airway obstruction
  - Stertor or stridor
- Expiratory
  - Lower airway obstruction
  - Wheeze or expiratory grunt
- Mixed/restrictive
  - Pulmonary parenchymal disease
  - Pleural space disease
  - Thoracic tracheal disease

Clinical Signs

+ Respiratory distress
  + Open mouth breathing
  + Air hunger
  + Increased effort

+ Cyanosis?

+ Pleural space disease
  + Reduced lung sounds

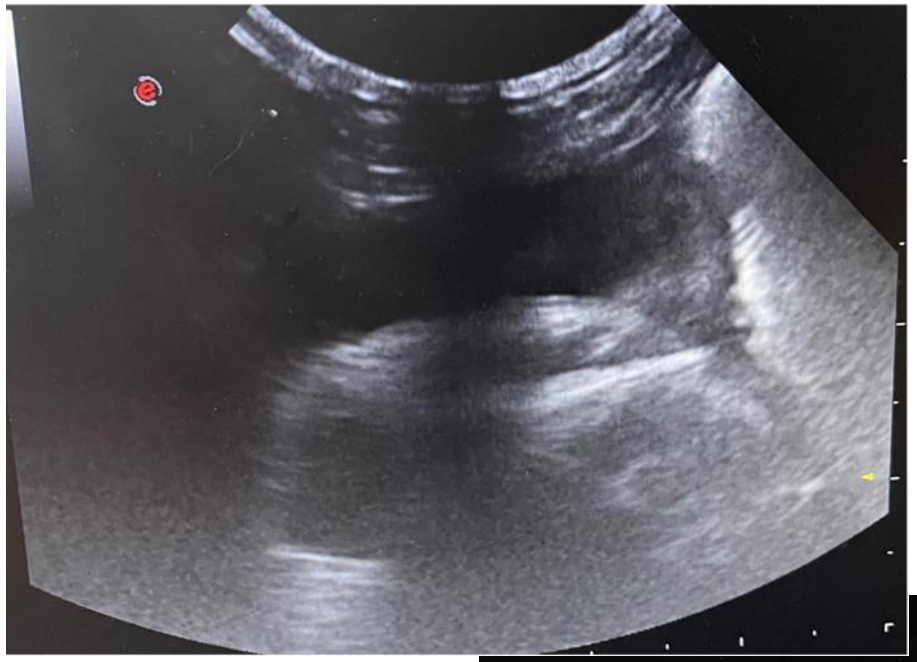
Stabilising The Dyspnoeic Patient

- Oxygen
  - Flow-by
  - Nasal prongs
  - Mask
  - Oxygen cages
- Reduce stress
- Anti-anxiolytic
  - Butorphanol s/c
- Delay all stressful interventions until more stable

Oxygen Cages

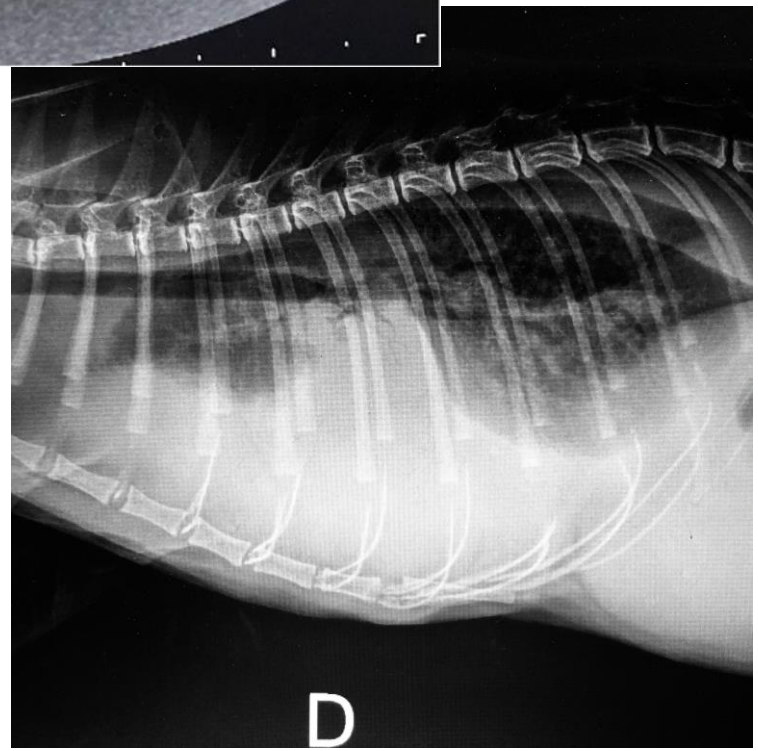
- Can be constructed using cling film
- Care with temp & humidity
- FiO_2 =40-60%
- O_2 levels return to normal immediately when door is opened.

Imaging The Dyspnoeic Patient



- POCUS
  - Very useful
  - Low stress for patient
  - Non-invasive
  - Minimal restraint

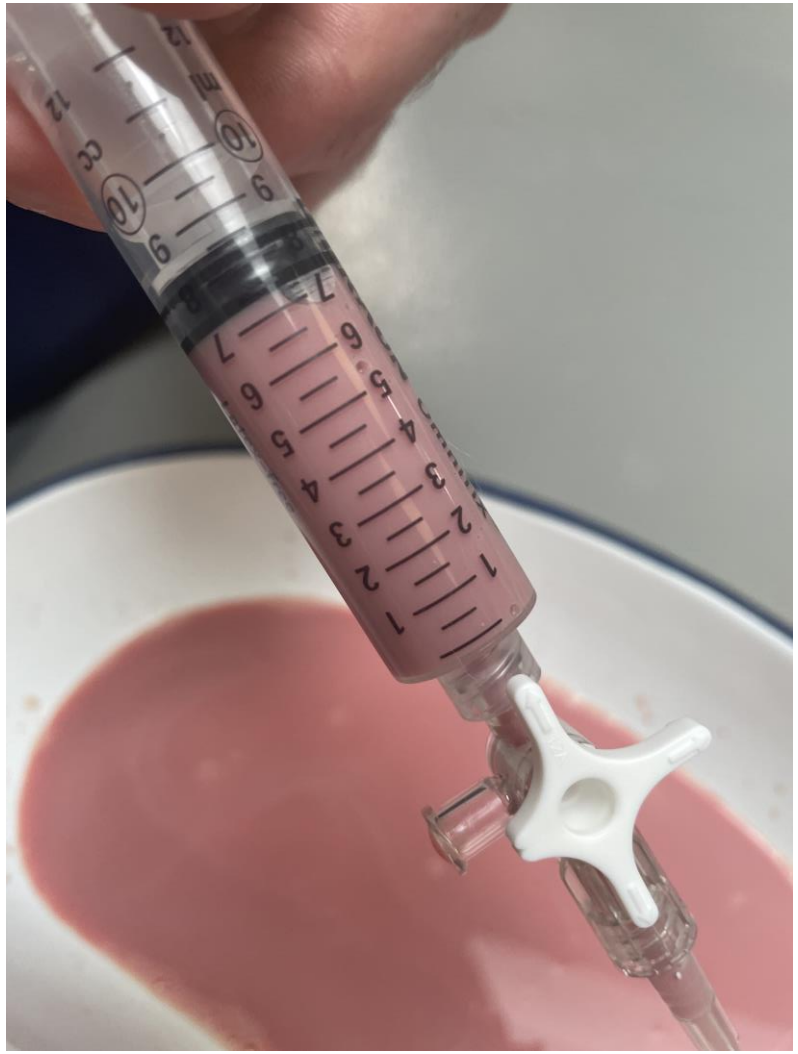
- Radiography?
  - Never force a dyspnoeic patient into lateral recumbency for radiographs



- CT?
  - Requires anaesthesia so never a first choice
  - May provide underlying diagnosis,
    - e.g. Bullae, foreign body, mass

POCUS for effusions

- May help hint at fluid type
- Transudate
  - Anechoic
- Exudate
  - Higher echogenicity
  - Flocculent
- Chyle and blood
  - More like a transudate but contain echogenic particles



Armenise A. Point-of-Care Lung Ultrasound in Small Animal Emergency and Critical Care Medicine: A Clinical Review. Animals (Basel). 2025 Jan 5;15(1):106. doi: 10.3390/ani15010106. PMID: 39795049; PMCID: PMC11718948.

Thoracocentesis

- In an emergency can be done without prior imaging
- 7th to 8th intercostal space
  - Ventrally for fluid, dorsally for air
  - Cranial to rib
  - POCUS will confirm need and best position
- Radiography may be stressful for patient and doesn't confirm best location
- Therapeutic and diagnostic!

Fluid Analysis

Fluid analysis

- Tubes
  - EDTA: Cell count, cytology
  - Sterile plain tube: biochemistry, culture
- Macroscopic appearance
- Cell count
  - Generally automated analysers
- Protein content:
  - Refractometer
  - Automated biochemistry analysis
  - For cloudy/turbid or bloody fluids, better on supernatant after centrifugation

Classification of effusions

+ Traditionally based on cell count and protein content:

	units	Pure transudate/ Protein poor	Modified transudate/ Protein rich	Exudate
Nucleated cells	cells/uL	<1500	<5000	>5000
Total protein	g/dL	<2.5	>2.5	>2.5

Other proposed cutoffs:

+ Exudate: cell counts > 3000 or 7000 cells uL
+ Pure transudate: proteins <2.0 g/dL

Raskin, R. E., Meyer, D., & Boes, K. M. (2021). Canine and feline cytopathology: a color atlas and interpretation guide. 4th ed. Elsevier Health Sciences.

Valenciano, A. C., & Cowell, R. L. (2019). Cowell and Tyler's Diagnostic Cytology and Hematology of the Dog and Cat. 5th ed. Elsevier Health Sciences.

Bohn, A. A. (2017). Analysis of canine peritoneal fluid analysis. Veterinary Clinics: Small Animal Practice, 47(1), 123-133.

Alonso, F. H., Christopher, M. M., & Paes, P. R. (2021). The predominance and diagnostic value of neutrophils in differentiating transudates and exudates in dogs. Veterinary Clinical Pathology, 50(3), 384-393.

Causes of effusions based on classification

- Protein poor/pure transudate:
  - Altered oncotic pressure (severe hypoalbuminaemia e.g. due to PLN, PLE, etc)
  - Altered hydrostatic pressure or lymphatic drainage (e.g. early cardiac insufficiency, occasionally space occupying masses)

- Protein rich/modified transudate:
  - Increased hydrostatic pressure due to venous congestion
  - Most commonly cardiac disease, also intrathoracic masses, lung lobe torsion, etc

- Exudate:
  - Increased vascular permeability due to inflammation
  - Infectious vs non-infectious

- Other types of effusion (e.g. haemorrhagic, chylous)

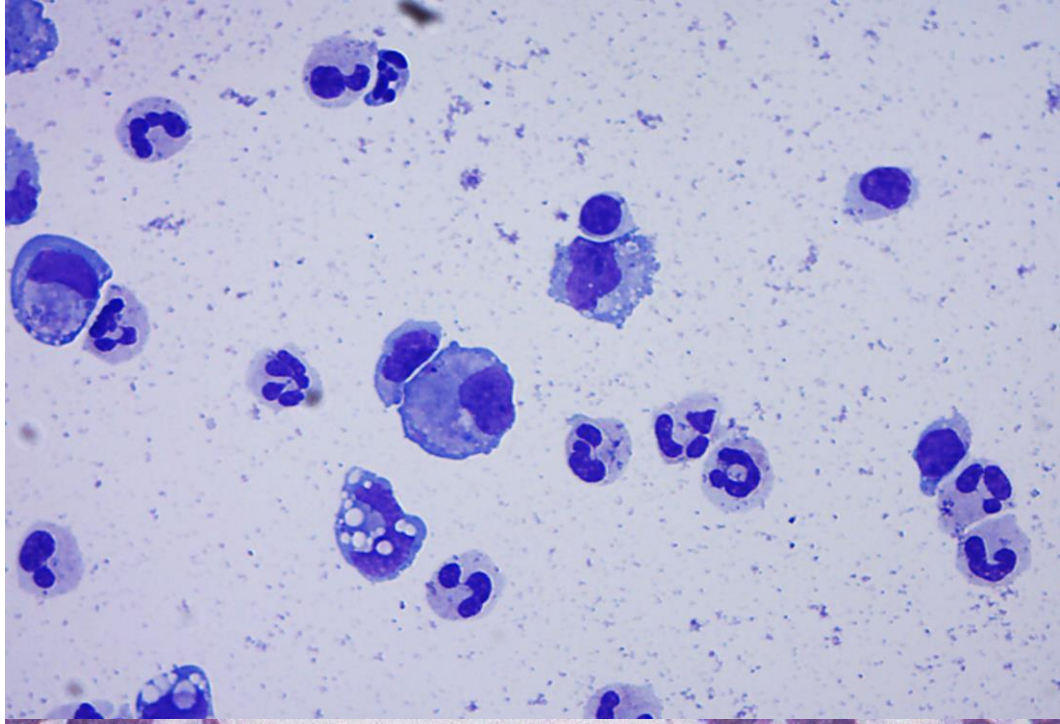
Cytological evaluation of effusions

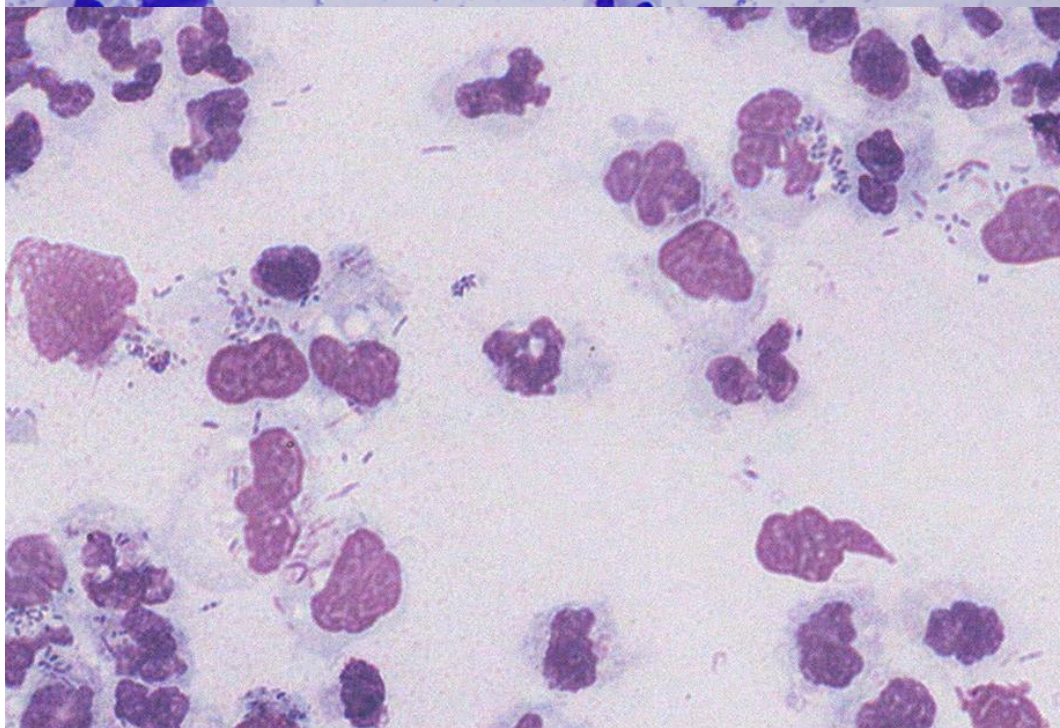
- **Fresh smears – fresh is better!!!**
- Direct (unconcentrated) smears
  - Blood smear technique
  - “Line smear” technique for low cellularity fluids
- Sediment (concentrated) for low cellularity fluids
  - Label slides (estimate of cellularity)

Line of concentrated cells

Cell types present in effusions

- Neutrophils
  - Non-degenerate vs degenerate
- Macrophages
- Lymphocytes





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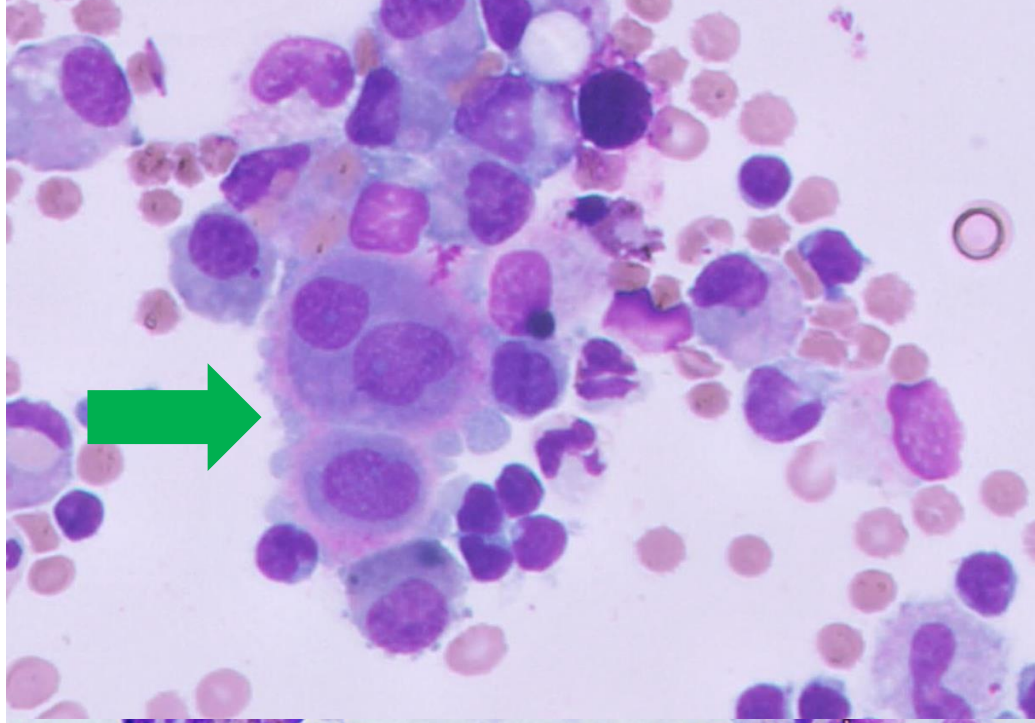
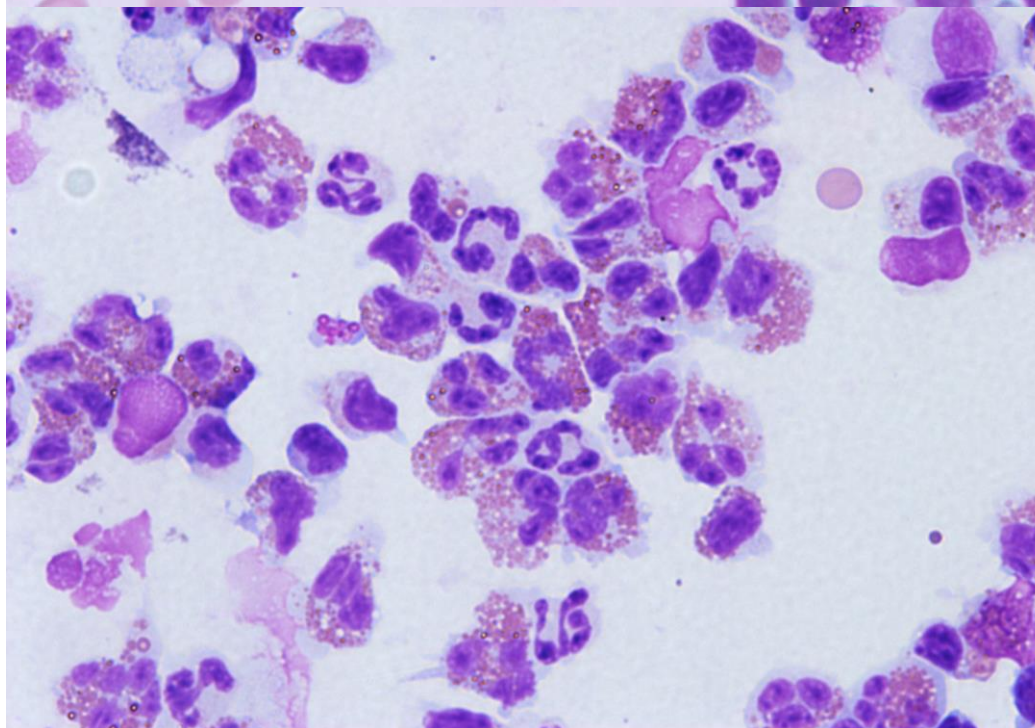
Cell types present in effusions

+ Neutrophils
    + Non-degenerate vs degenerate
+ Macrophages
+ Lymphocytes
+ Mesothelial cells
+ Others e.g. eosinophils (rare), atypical cells





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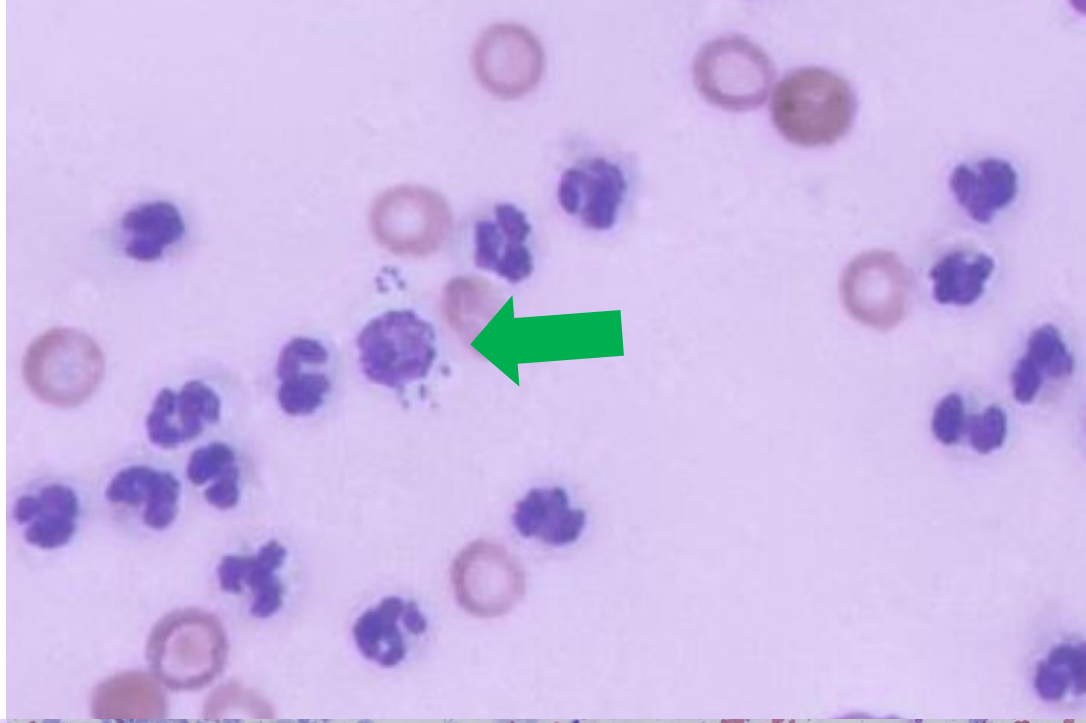
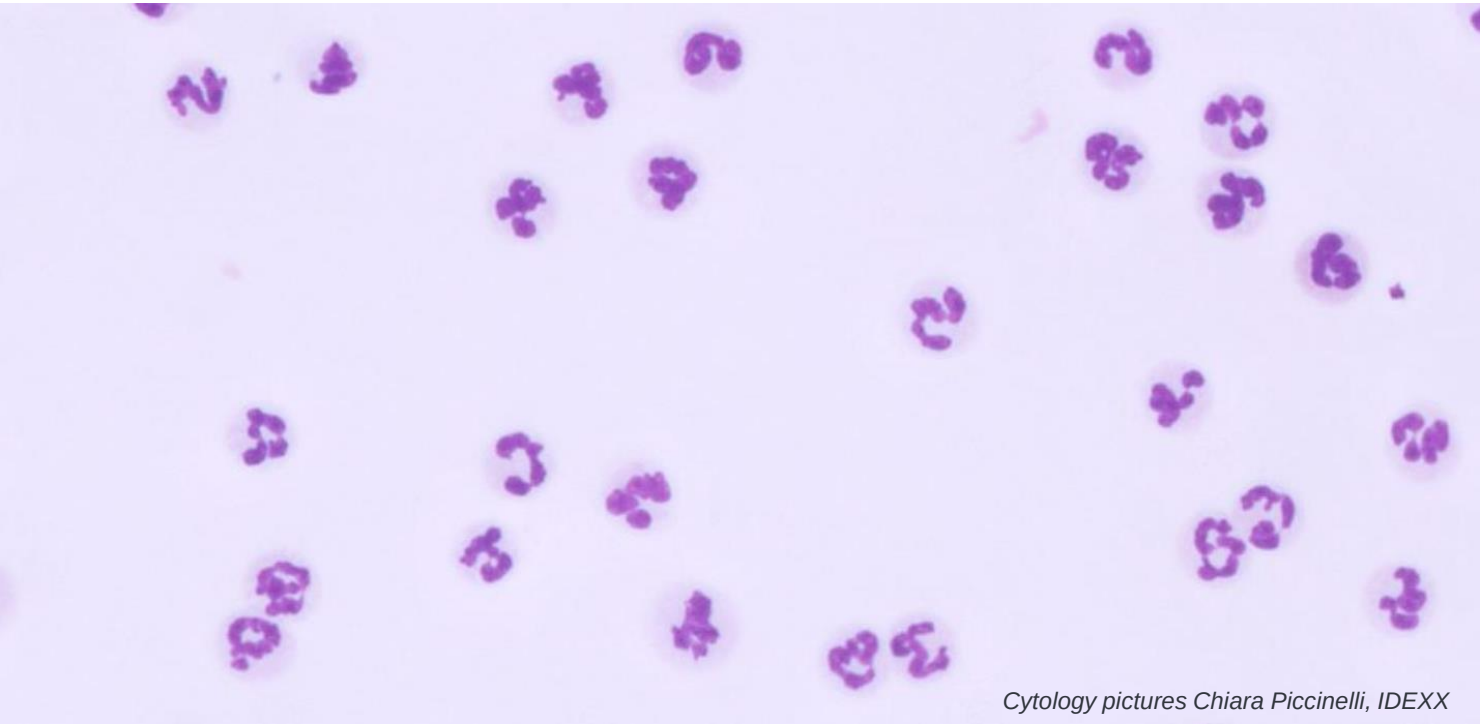
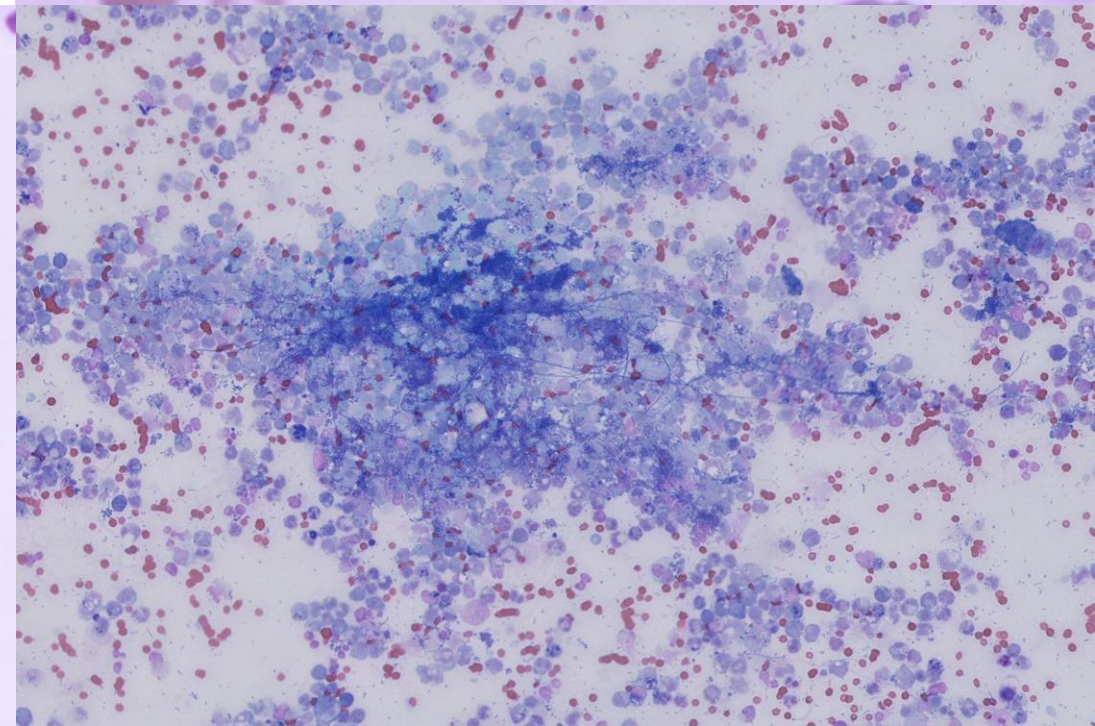
Specific types of effusion

- Exudate, neutrophilic inflammation
  - Septic (bacteria, fungi, parasites)
  - Non-septic (inflammation of intracavitary organ, walled off abscess, underlying neoplasia)







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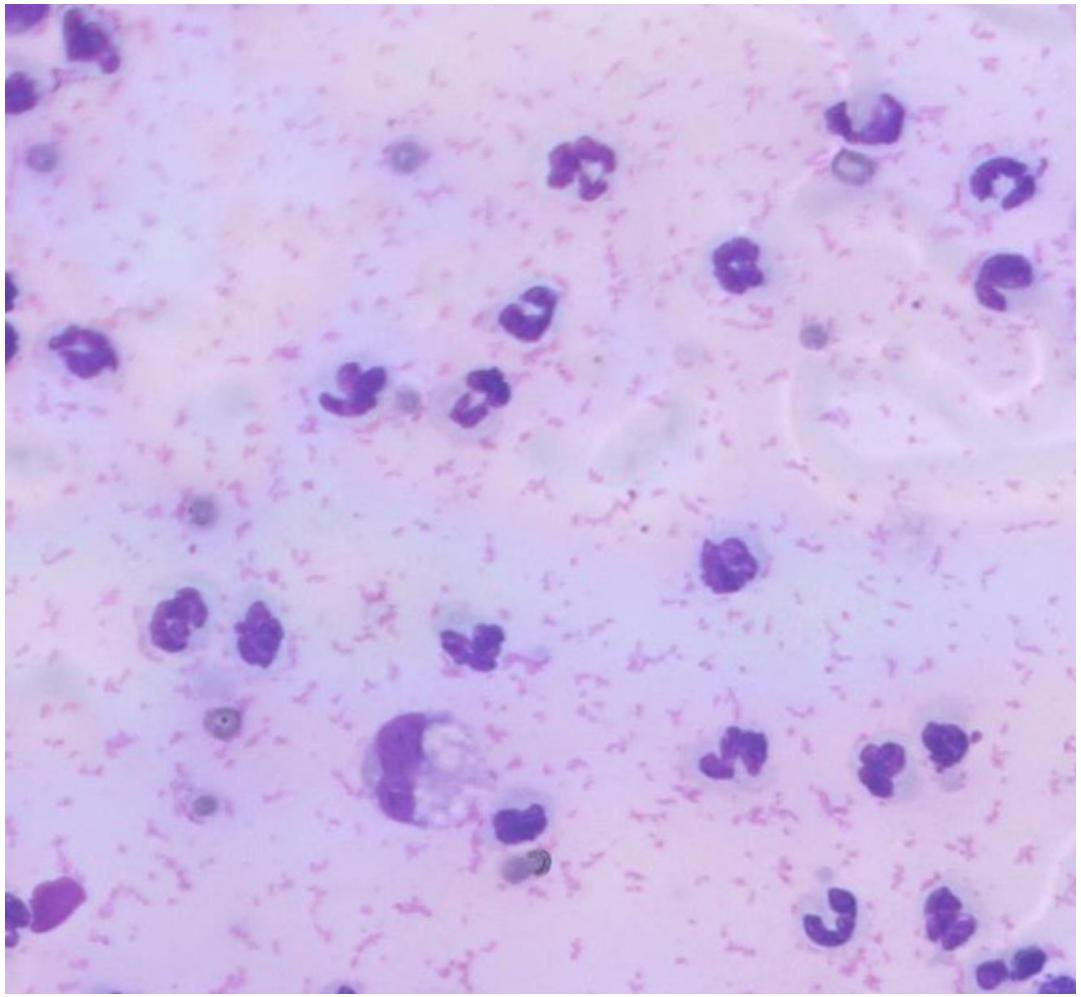
Specific types of effusion

- Feline Infectious Peritonitis
  - Typically a high protein, low cell count fluid
  - Protein content:
    - Often >35 g/L
  - Cell count:
    - Mostly low (<5 x10e9/L) to sometimes moderate (<20x10e9/L)
  - Types of cells:
    - Mostly non-degenerate neutrophils, macrophages +/- a few lymphocytes



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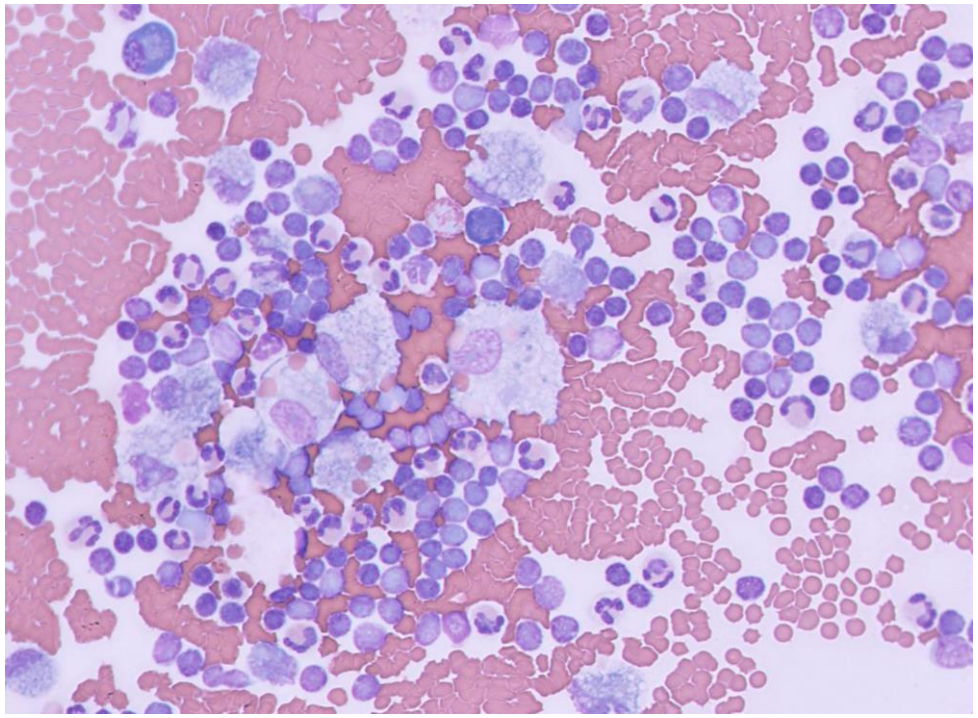
Tasker, Séverine et al. “Feline Infectious Peritonitis: European Advisory Board on Cat Diseases Guidelines.” Viruses vol. 15,9 1847. 31 Aug. 2023, doi:10.3390/v15091847

Chylous and lymphocyte-rich effusions

- Chylous effusion
  - Chylomicron-rich and lymphocyte-rich lymph leaks from lymphatic vessels
  - Milky to pink-white, modified transudate or exudate
  - Predominance of small lymphocytes, over time neutrophils and macrophages increase

Criteria for chylous effusion

- Triglyceride fluid > 100 mg/dL
- Triglyceride fluid > serum
- Fluid cholesterol: triglyceride ratio <1



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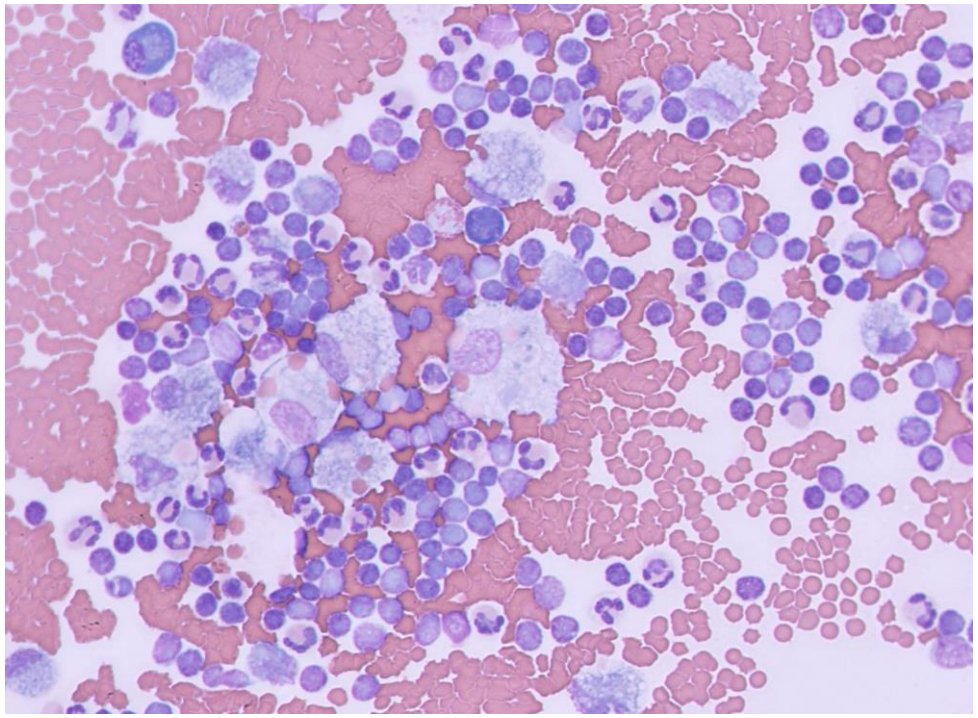
Chylous and lymphocyte-rich effusions

- Chylous effusion

- Causes:
  - Frequently idiopathic
  - Cardiac disease
  - Presence of intrathoracic masses (e.g. neoplasia such as thymoma, granulomas)
  - Diaphragmatic hernia
  - Lung lobe torsion
  - Trauma
  - Less commonly chronic coughing or vomiting



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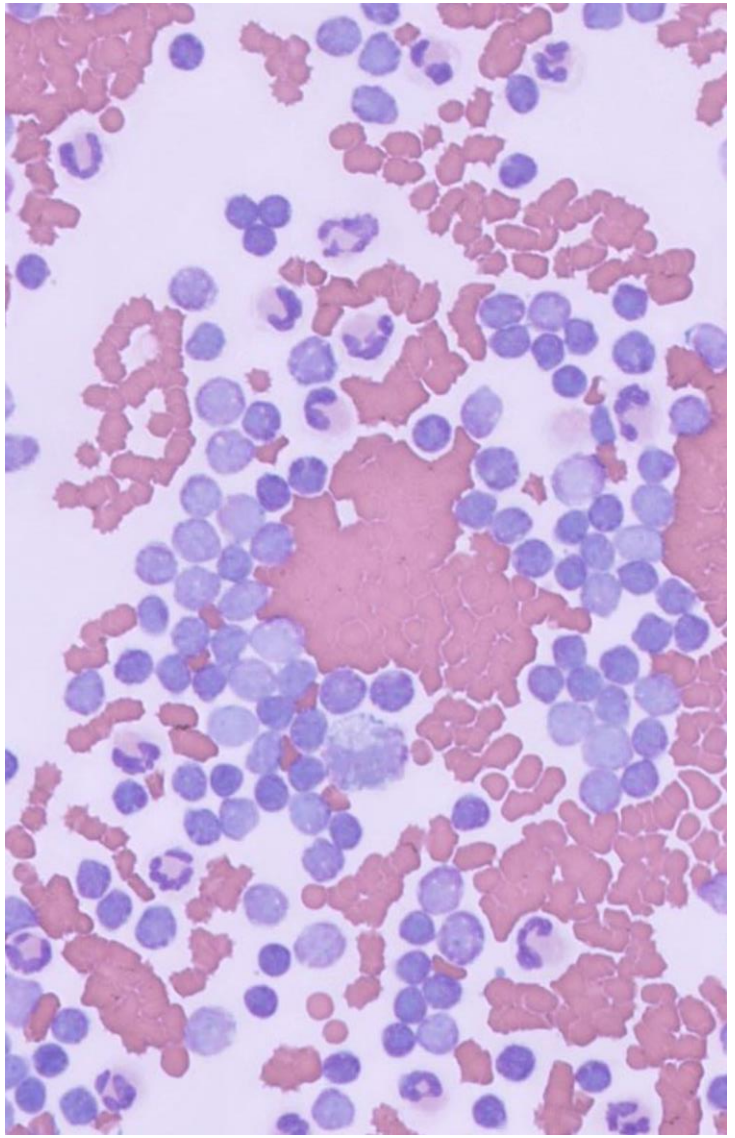
Chylous and lymphocyte-rich effusions

- Lymphocyte-rich effusion in cats
  - Predominance of small lymphocytes but lack of chylomicrons
  - Lacks the milky appearance of chylous
  - Fluid triglycerides generally < 100 mg/dL and always < serum
- Causes
  - Cardiac disease (69.7%)
  - Mediastinal lymphoma (12%)
  - Space occupying thoracic lesion (9.1%)
  - Thymoma, carcinoma, sequela to pyothorax (3% each)



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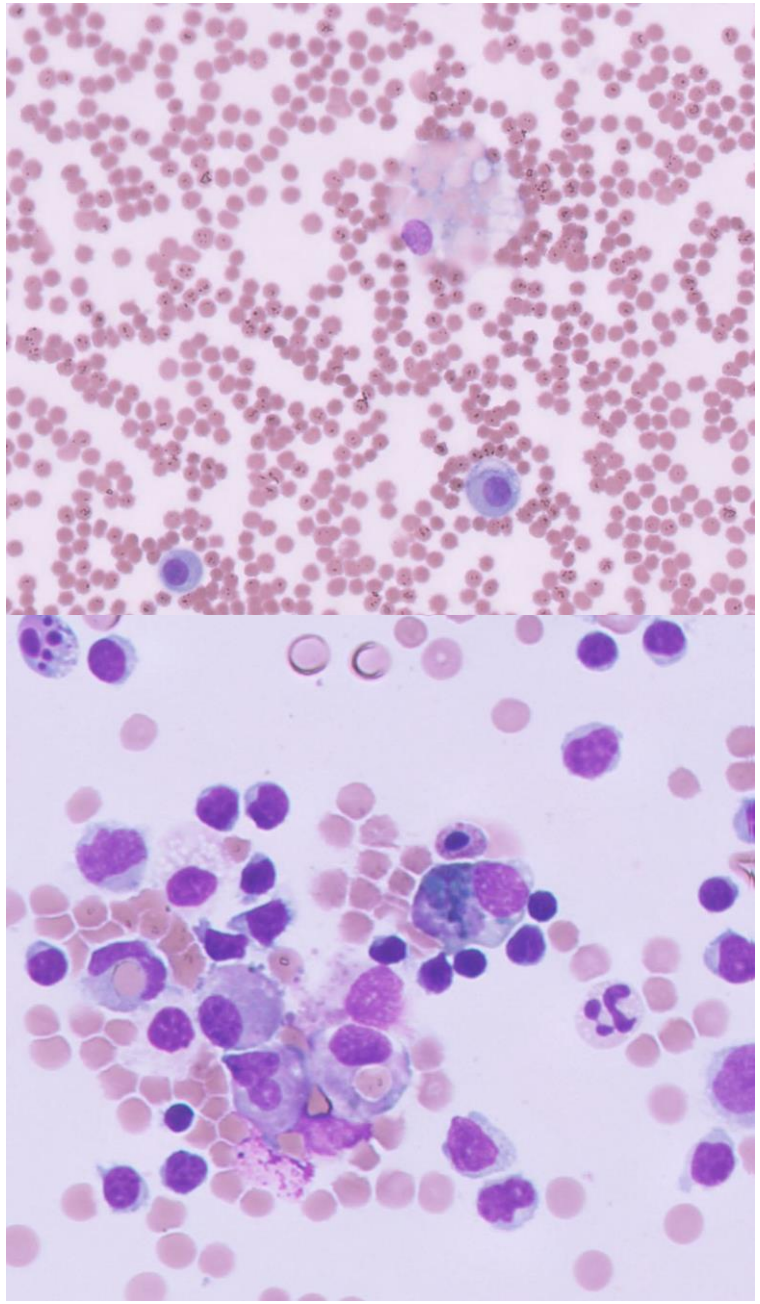
Probo, M., Valenti, V., Venco, L., Paltrinieri, S., Lavergne, E., Trumel, C., & Bertazzolo, W. (2018). Pleural lymphocyte-rich transudates in cats. Journal of feline medicine and surgery, 20(8), 767-771.

Haemorrhagic effusion

- High numbers of RBCs (> 1,000,000/uL ,PCV > 10%)
- PCV of fluid should be at least 10% to 25% of the peripheral blood
- Lack of platelet (1 hour)
- Erythrophagocytosis/haemoglobin breakdown products

- Causes:
  - Defects of haemostasis (e.g. anticoagulant rodenticides)
  - Trauma
  - Neoplasia



Cytology pictures Chiara Piccinelli, IDEXX

Alleman, A. R. (2003). Abdominal, thoracic, and pericardial effusions. Veterinary Clinics: Small Animal Practice, 33(1), 89-118.

Dempsey, S. M., & Ewing, P. J. (2011). A review of the pathophysiology, classification, and analysis of canine and feline cavitary effusions. Journal of the American Animal Hospital Association, 47(1).

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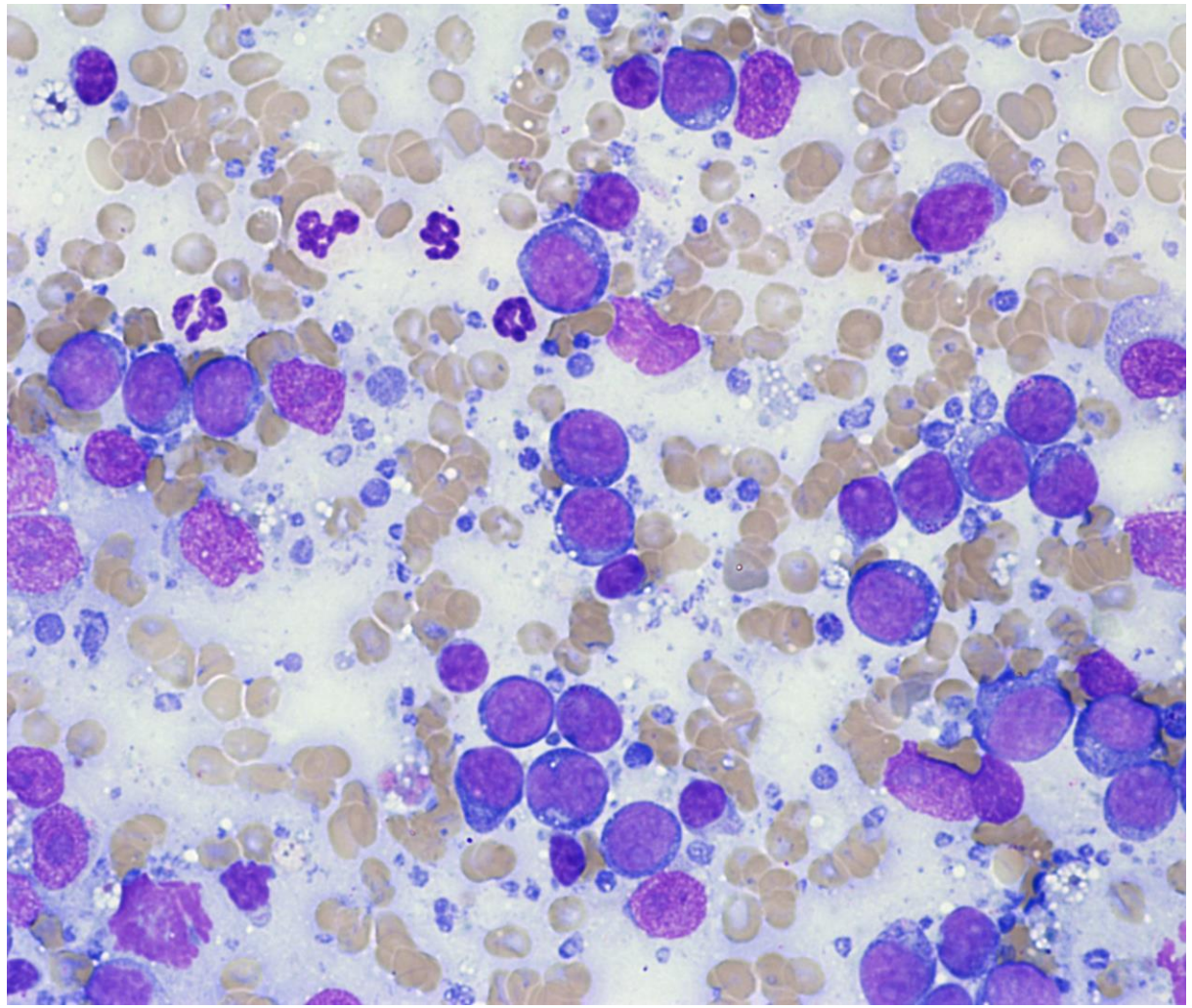
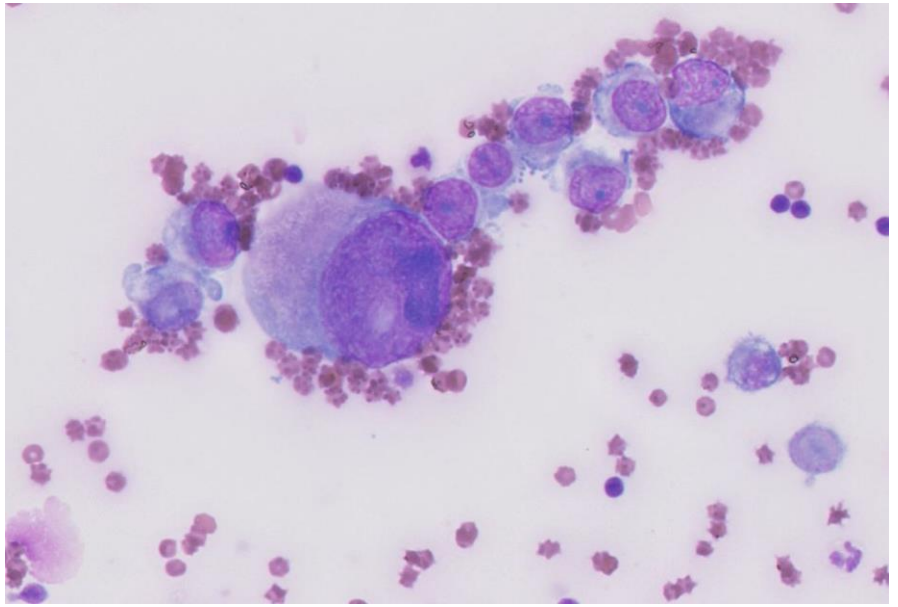
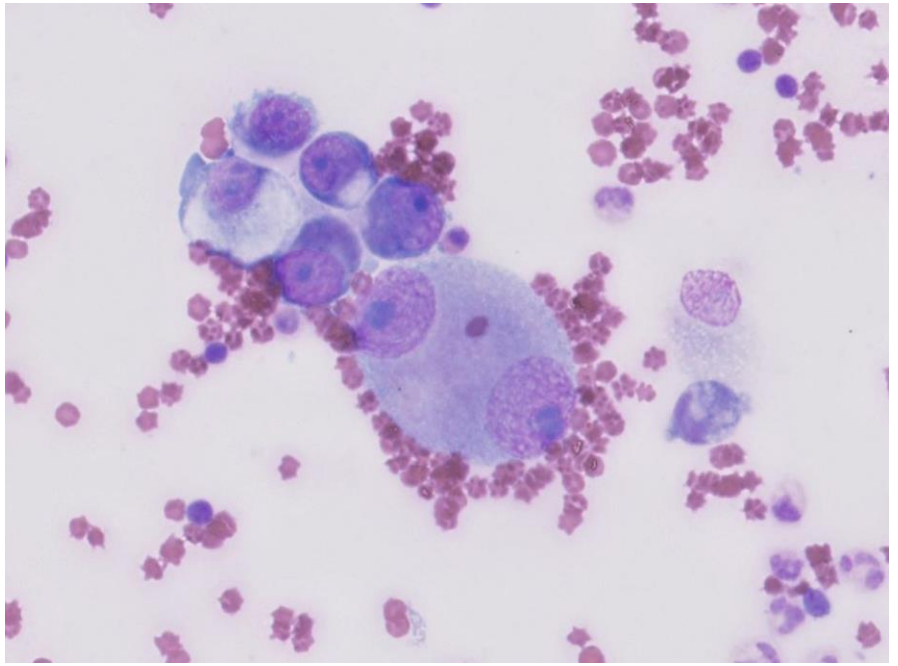
Atypical cells







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Atypical cells

Reactive mesothelium vs neoplasia

(especially in dogs)

+ Mesothelial cells can appear relevantly pleomorphic when reactive e.g. chronic effusion

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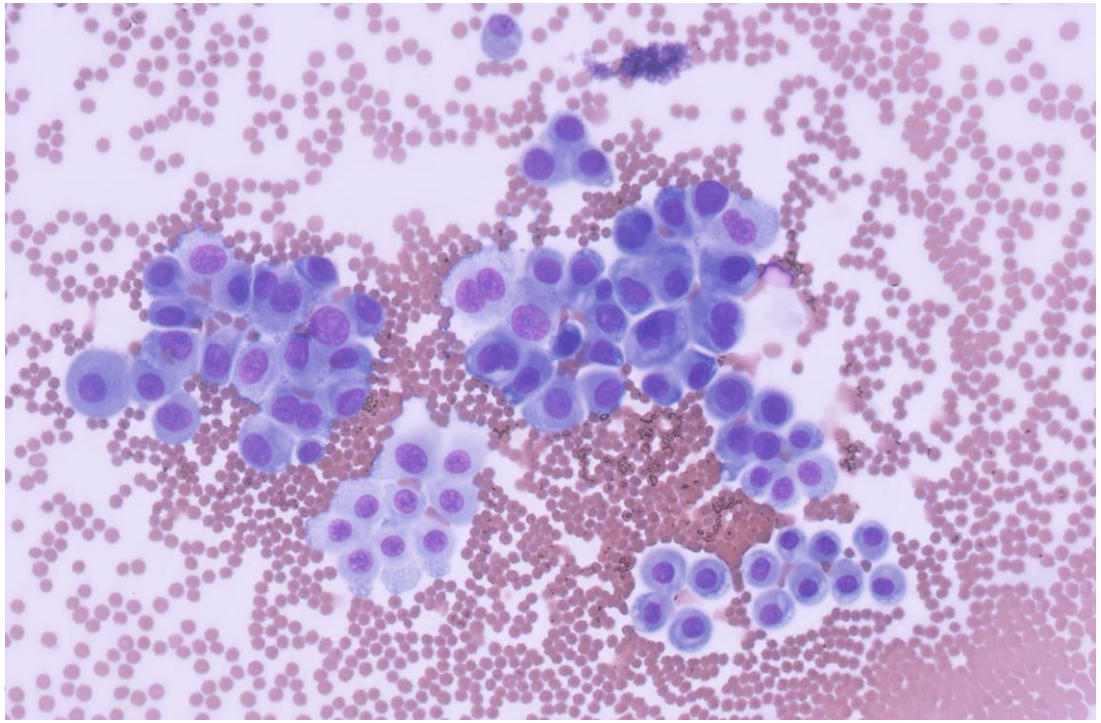
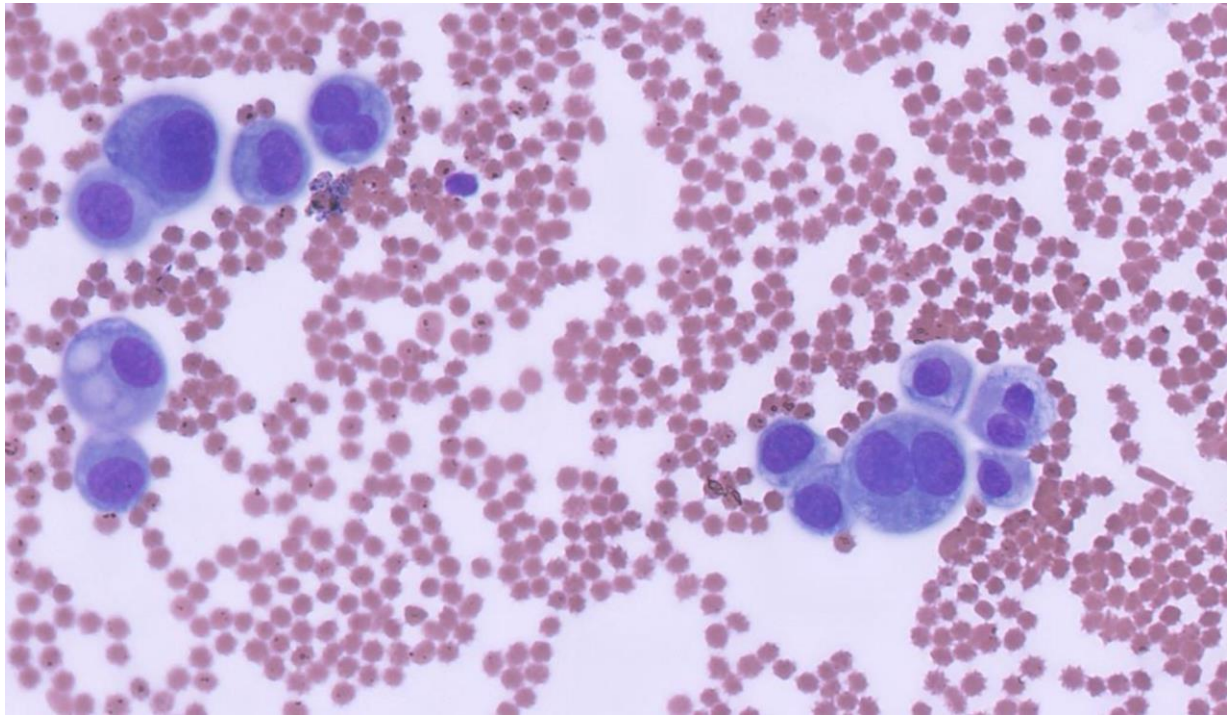
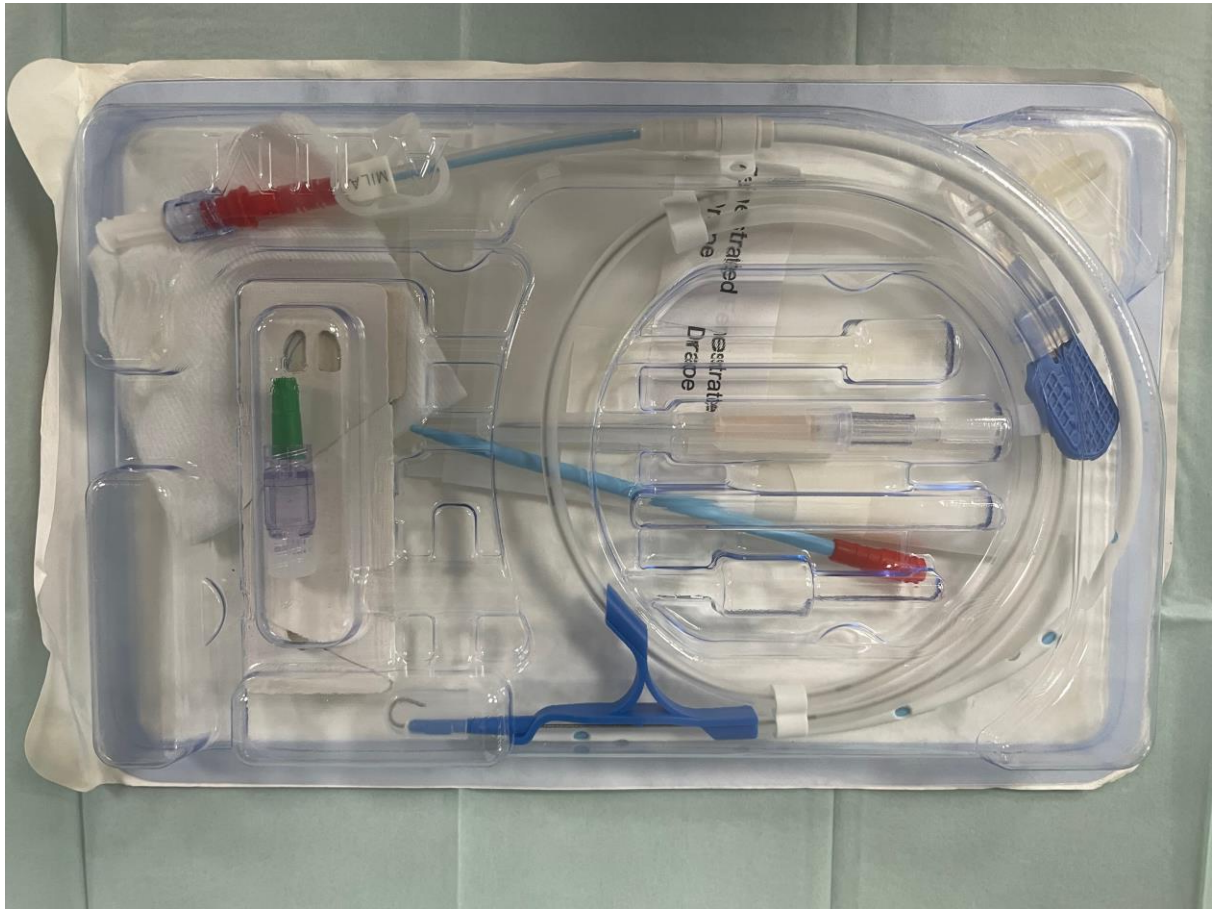




Placement & Maintenance of Chest Drains

Small Bore Chest Drain

+ Often only requires sedation
+ Seldinger technique
+ Fewer complications
+ More comfortable

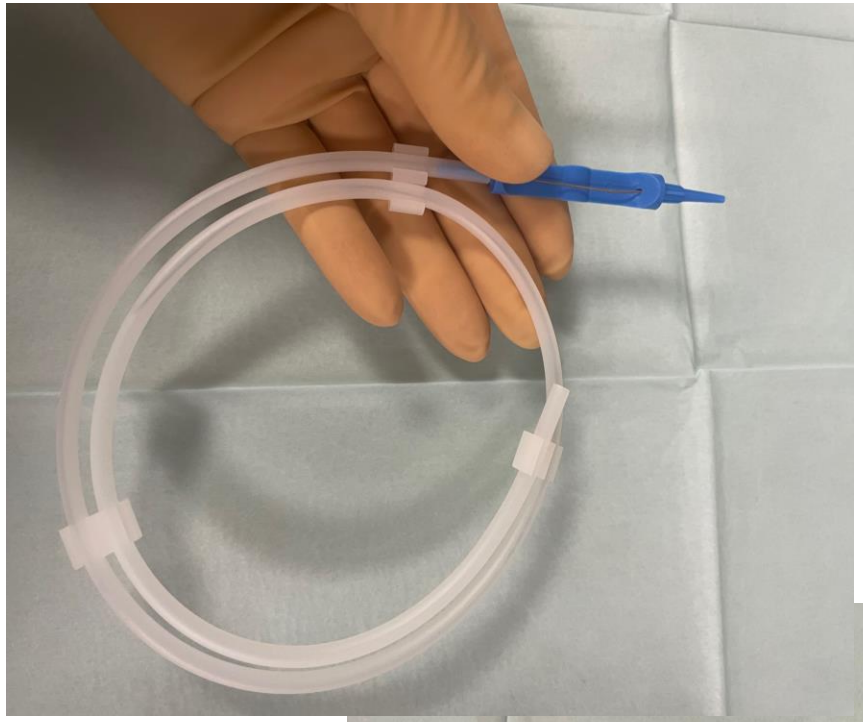


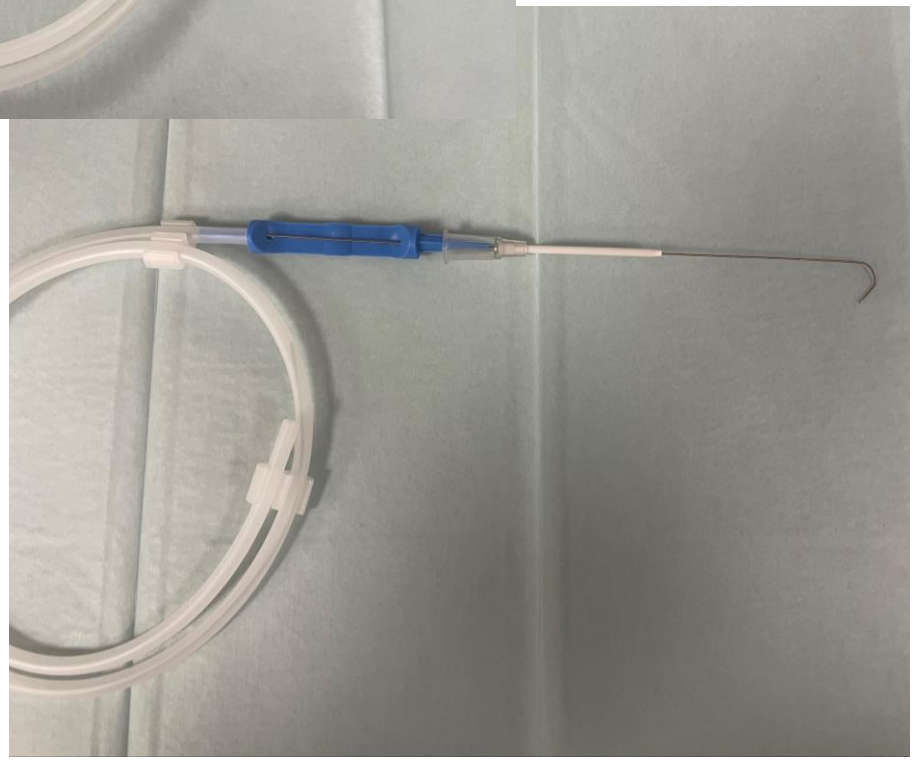
Step 1

+ Surgical prep of skin
+ Local anaesthesia at insertion site
+ Small skin incision over 10th ICS
+ Insert IV catheter through skin and into thoracic cavity at 8th ICS (over cranial edge of rib)
+ Withdraw inner stylet
+ Cover end of catheter with thumb

Step 2

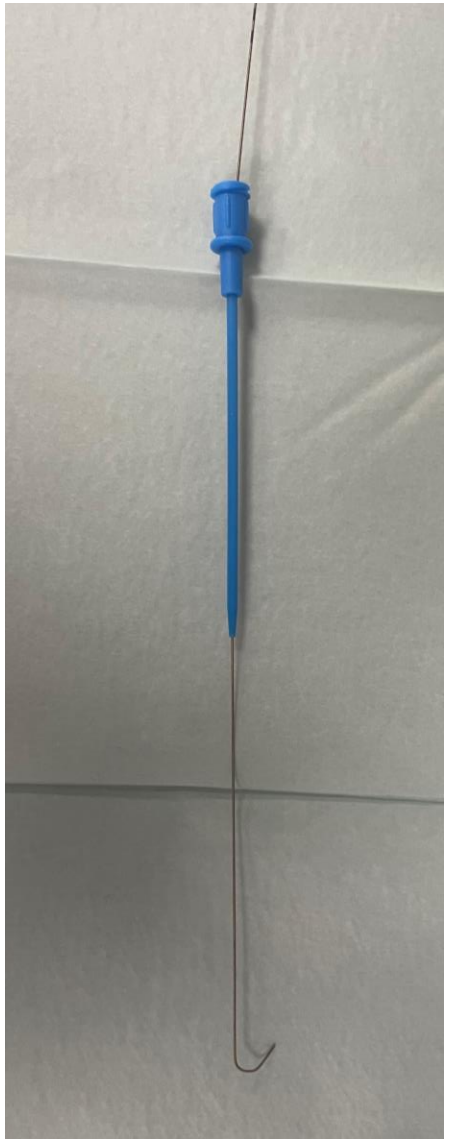
+ Insert the seldinger wire into catheter
+ Pass some of the wire into the thorax
+ Do not let go of the wire!!!!
+ Remove the plastic loop introducer





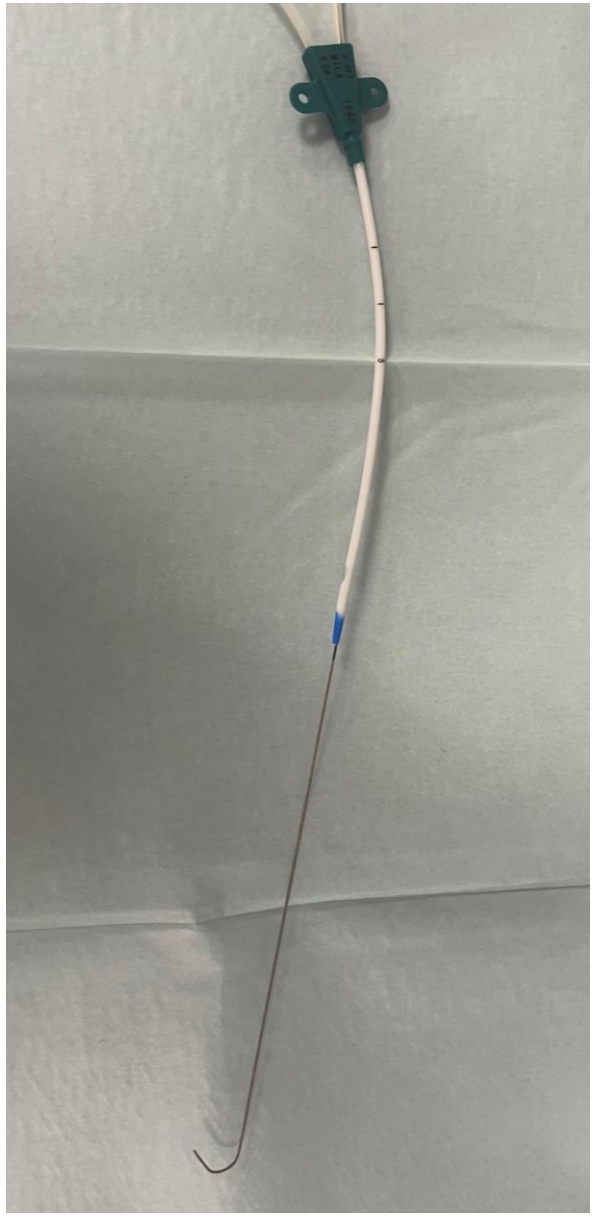
Step 3

+ Now only the wire is in the chest
+ Pass the dilator over the wire
+ Do not let go of the wire
+ Move the dilator to and fro through the skin incision with a twisting motion



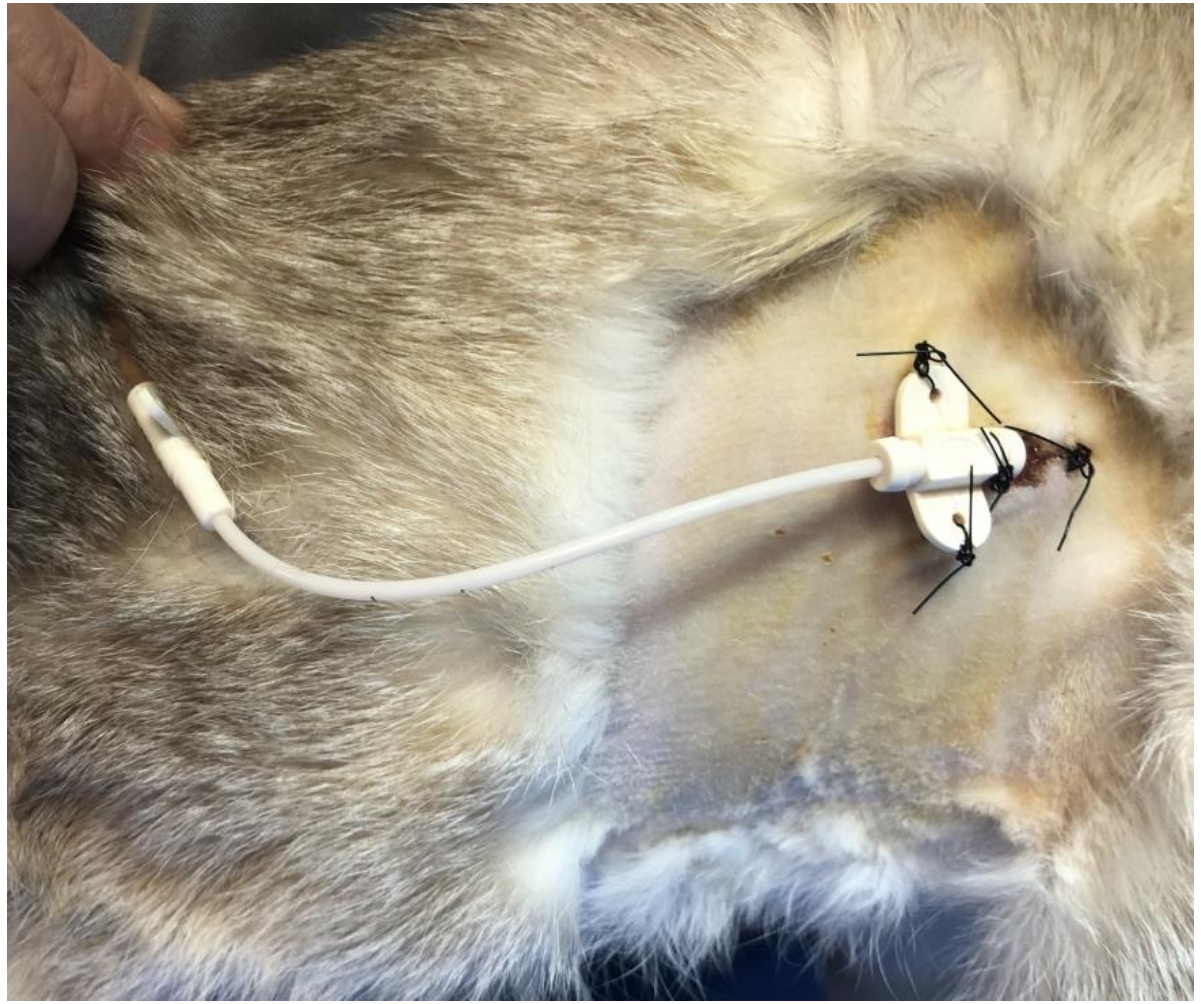
Step 4

- Remove the dilator leaving the wire in place
- Do not let go of the wire!
- Pass chest drain over the wire
- Insert into chest ensuring all fenestrations are in the chest
  - Advance to level of 2nd rib
- Do not let go of the wire!



Step 5

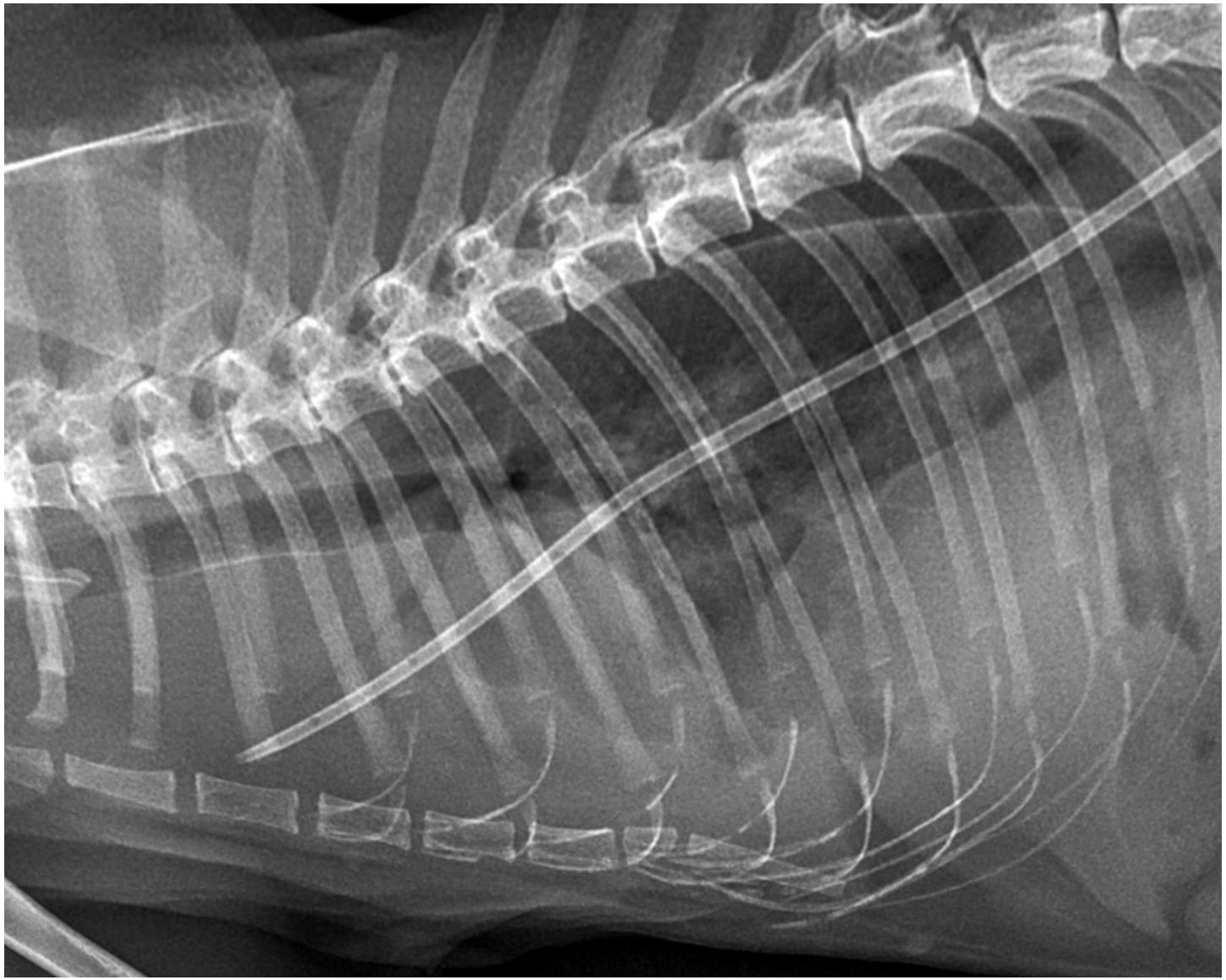
+ Remove the wire
+ Leave drain in chest
+ Ensure all fenestratrations are in thorax
+ Suture in place
+ Aspirate drain to remove air/fluid



Head

Step 7

+ Confirm drain placement and position with radiography



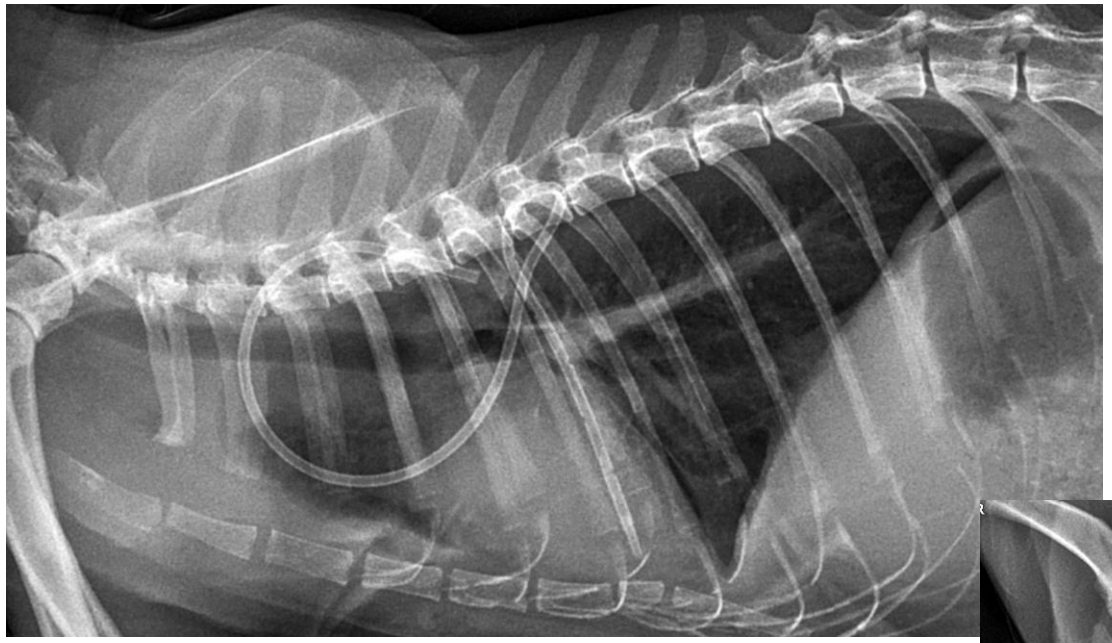
Step 8

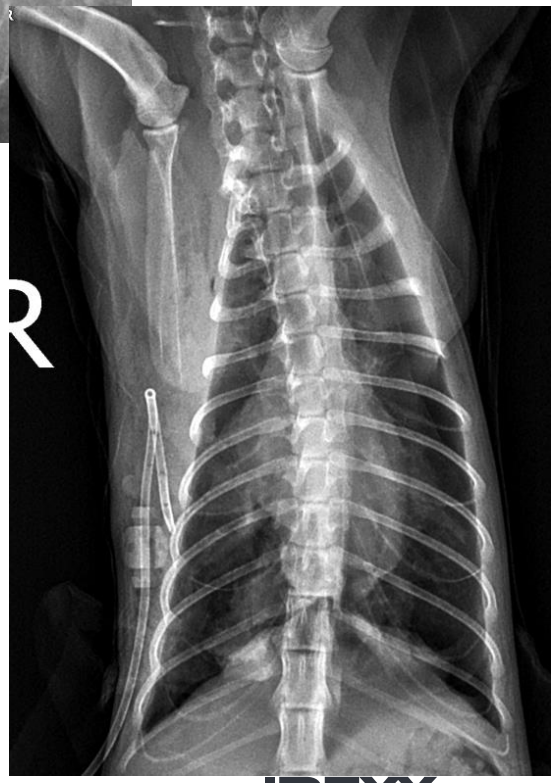
Drain Maintenance

+ Elizabethan collar
+ Wear gloves when handling drain
+ Aspirate every 2-4 hrs
+ Flush??
    + Controversial
+ Record volume of air/fluid retrieved
+ Analgesia

Drain Complications

+ Pneumothorax (33%)
+ Soft tissue swelling (14%)
+ Kinking (13%)
+ Pulmonary laceration (7%)
+ Infection fairly uncommon





Boullhesen Williams T, Fletcher D, Fusco J, Bichoupan A, Weikert L, Barenas M, Menard J. Retrospective Evaluation of the Use and Complications of Small-Bore Wire-Guided Thoracostomy Tubes in Dogs and Cats: 156 Cases (2007-2019). Front Vet Sci. 2022 Mar 31;9:818055. doi: 10.3389/fvets.2022.818055. PMID: 35433912; PMCID: PMC9009258.

Drain Removal

+ Clinical improvement
+ When drain produces less than 2ml/kg/24h
+ Cytological improvement
+ Remove drain quickly to avoid pneumothorax
+ Allow to heal by 2nd intention

Any Questions?

Please visit the IDEXX booth if you would like a copy of the notes