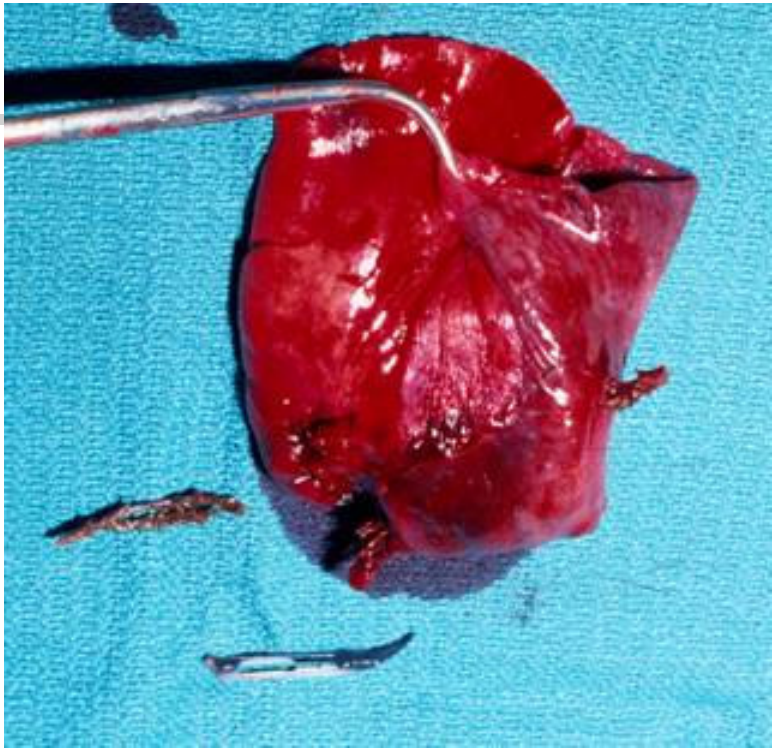
Pyothorax

Eric MONNET, DVM, Ph.D., FAHA
Diplomate ACVS, ECVS
College of Veterinary Medicine
Colorado State University

Pyothorax

- Septic exsudate in the pleural cavity
- Bacteria
- Fungus

Pyothorax



- Migrating foreign body
- Pneumonia
- Lung abscess
- Penetrating wound
- Post-operative infection
- Diskospondylitis
- Hematogenous spread

Pyothorax

- Moderate to severe respiratory distress
- Slow progression
- Anorexia
- Weight loss
- Fever

Pyothorax

- Difficulty breathing
- Dyspnea
  - Reduce functional reserve capacity
  - Rapid shallow breathing
- Exercise intolerant

Pyothorax

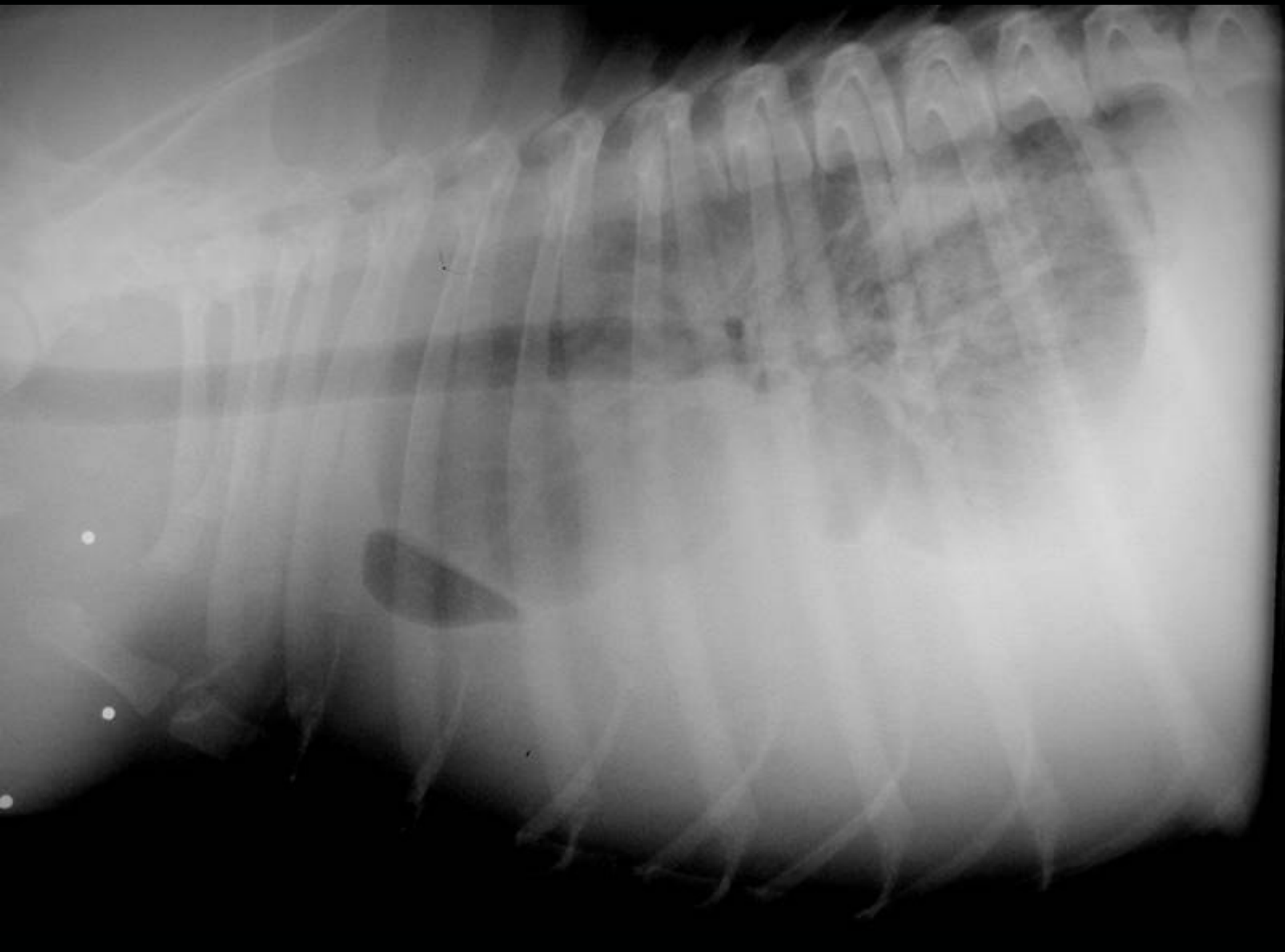
- Physical examination
  - Elevated temperature
  - Decreased CRT
  - Weak femoral pulse

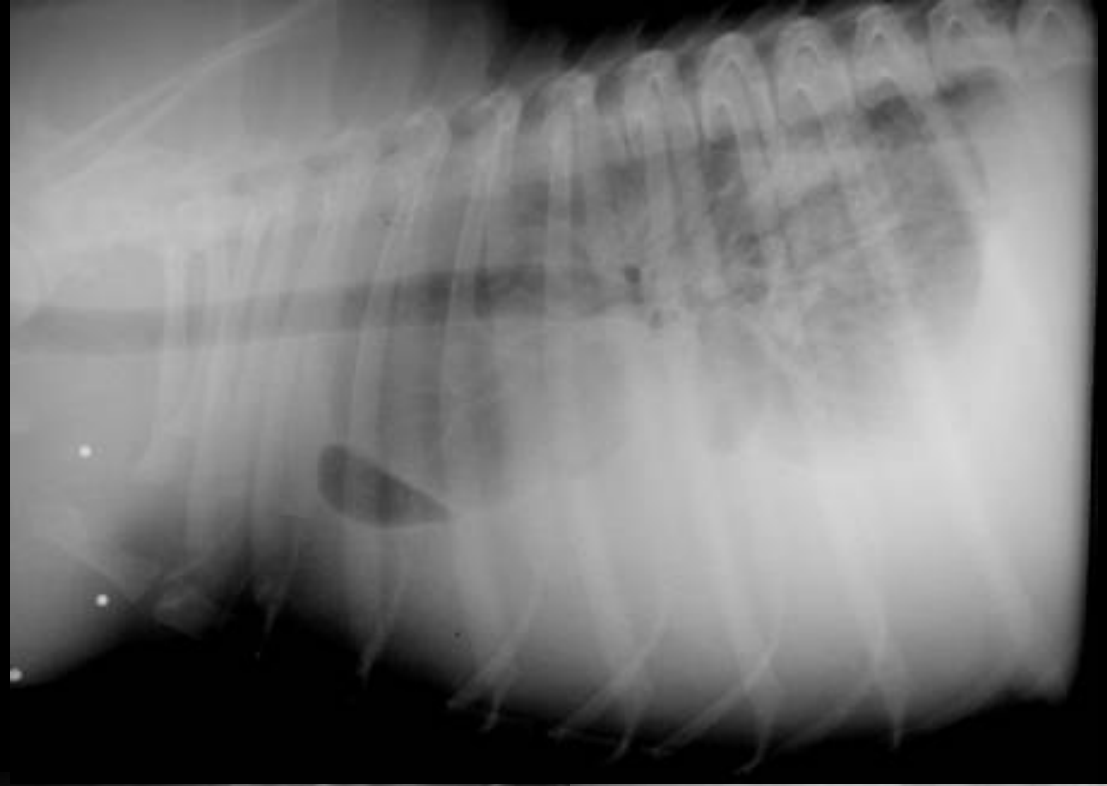
Pyothorax

- Dehydrated
- Abdominal effusion

Pyothorax

- Auscultation
  - Decreased lung sounds
  - Fluid line



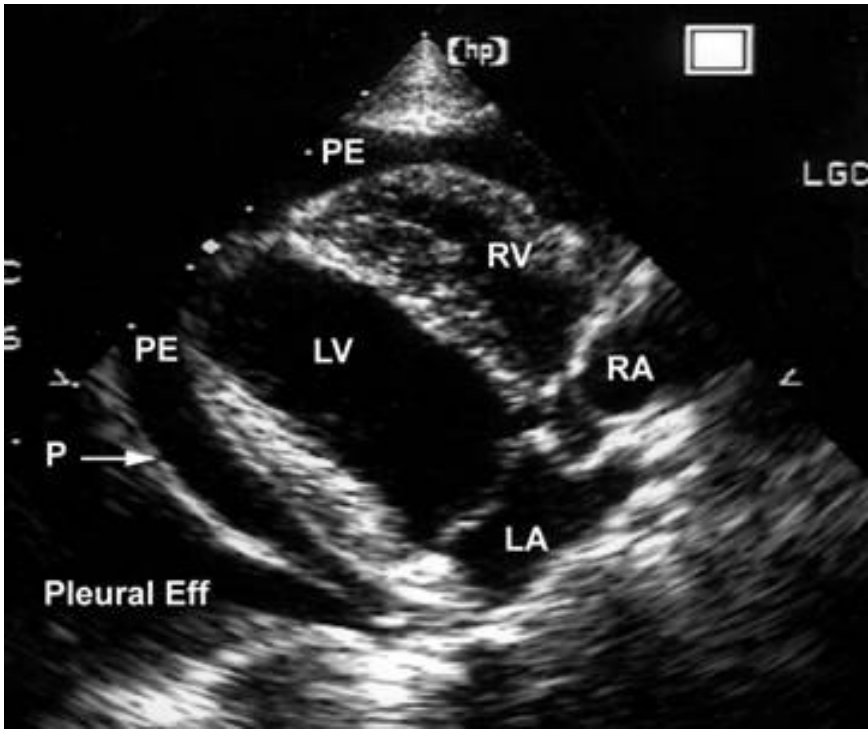


Pyothorax

- Complete blood count
  - Leukocytosis with a left shift
- Biochemistry
  - Liver enzymes
- Coagulation profile
- Urine analysis

Pyothorax

- Echocardiography
  - Cardiac function
  - Pericardium
    - Thickness
  - Pericardial effusion

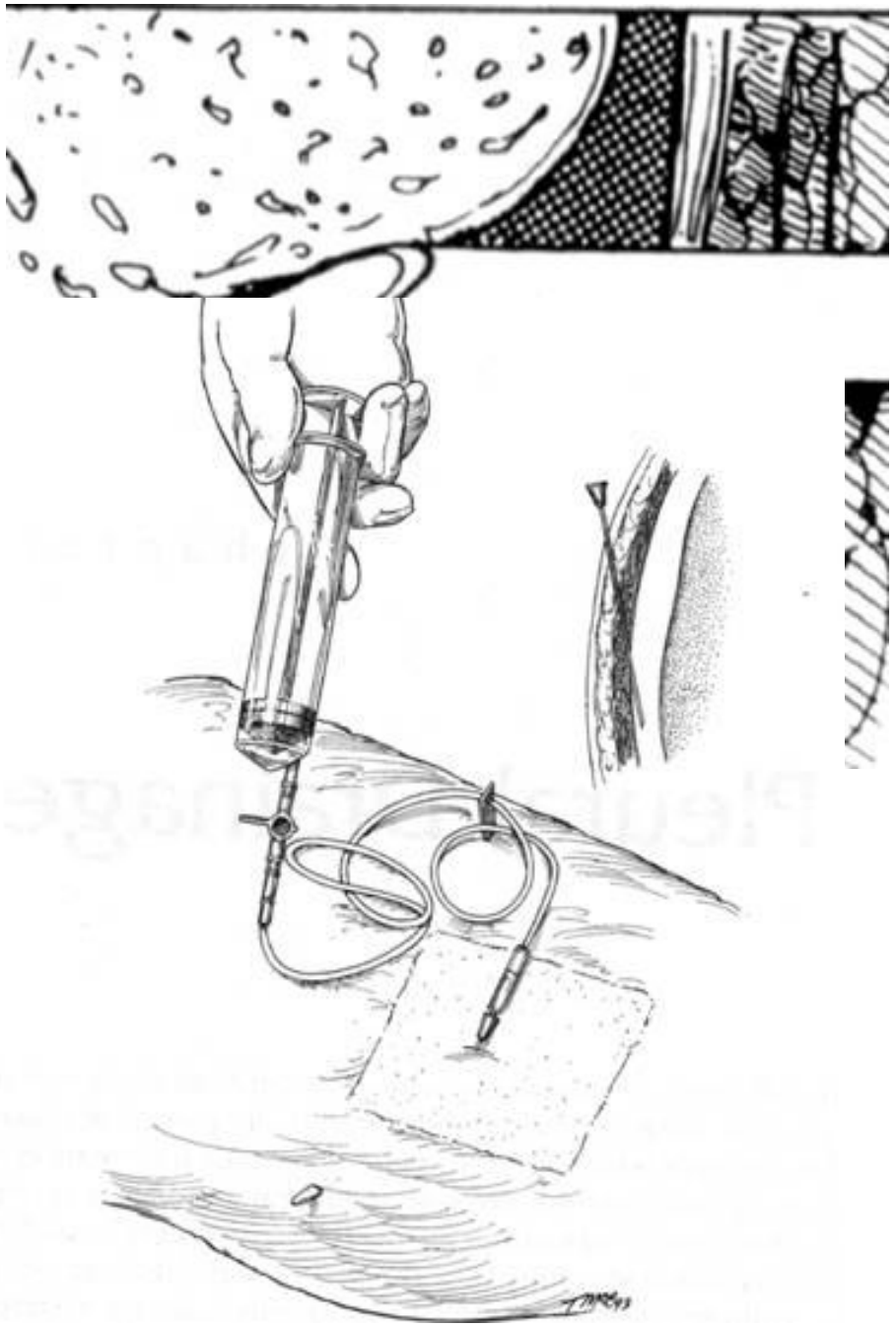


Pyothorax

- Thoracic ultrasound
  - Fluid in thoracic cavity
  - Adhesions ?
  - Cavitation ?

Pyothorax

- Pleurocenthesis
  - 20 G needle
  - 6 ml syringe
  - Cytology
  - Biochemistry



Pyothorax: Exsudate

- Specific gravity > 1.018
- Protein > 3 gm/dl
- Nucleated cells > 7,000 cells/microl
- Degenerative neutrophils
- Glucose < 10 mg/dl
- pH < 6.9
- Bacteria

Pyothorax

- Medical Vs surgical treatment
- Thoracoscopy?

Pyothorax

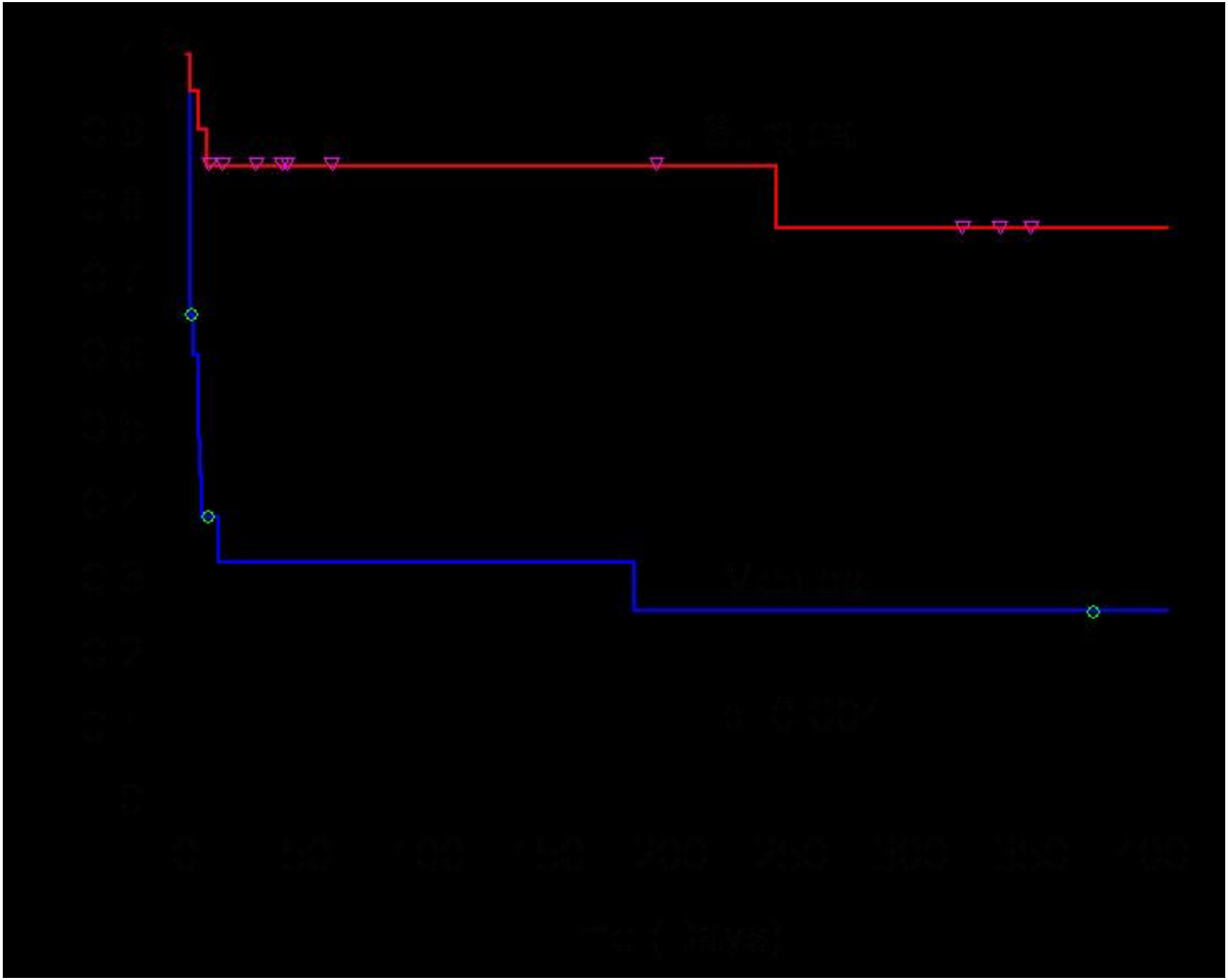
- Thoracoscopy
  - Help to medical treatment
  - Evaluate pleural space/pericardium
  - Biopsy/Cultures
  - Debridement
    - More efficient drainage and lavage

Pyothorax

- Medical treatment
- Dogs vs Cats

Pyothorax

- Cat: medical treatment: 61% survival rate
- Dog: surgical treatment
  - Medical 1 year DFI: 30%
  - Surgical 1 year DFI: 80%



Pyothorax

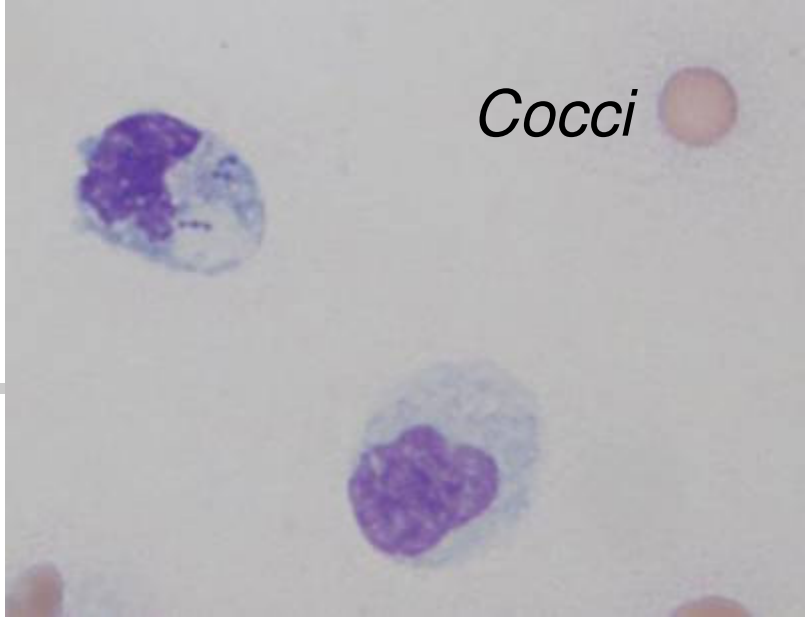
- Medical treatment
- Dogs vs Cats
- Patient stable
  - Septic
  - DIC

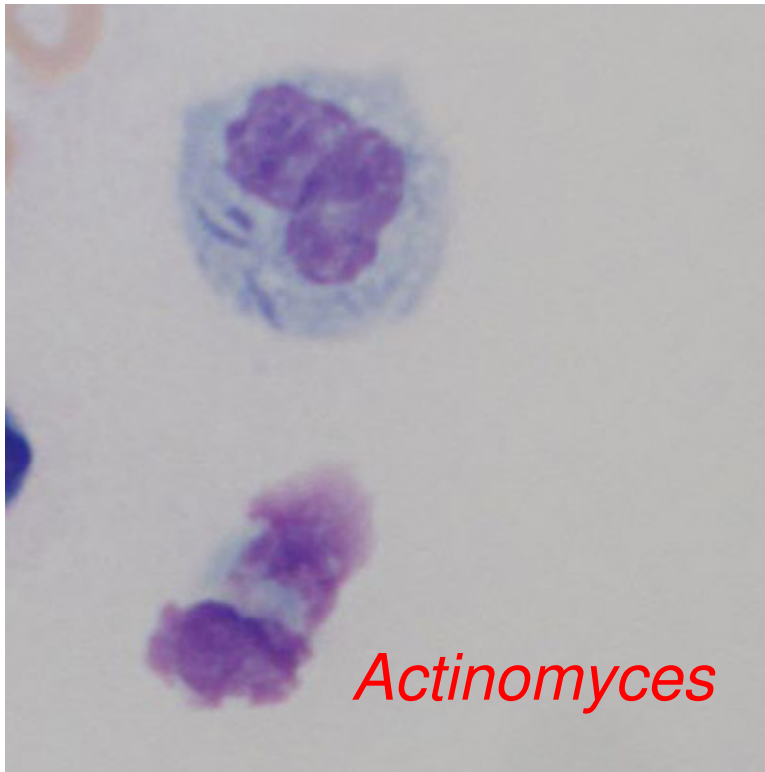
Pyothorax

- Medical treatment
- Amount of fluid
- Easy to drain

Pyothorax

- Medical treatment
- No lung mass
- Bacterial population





Pyothorax

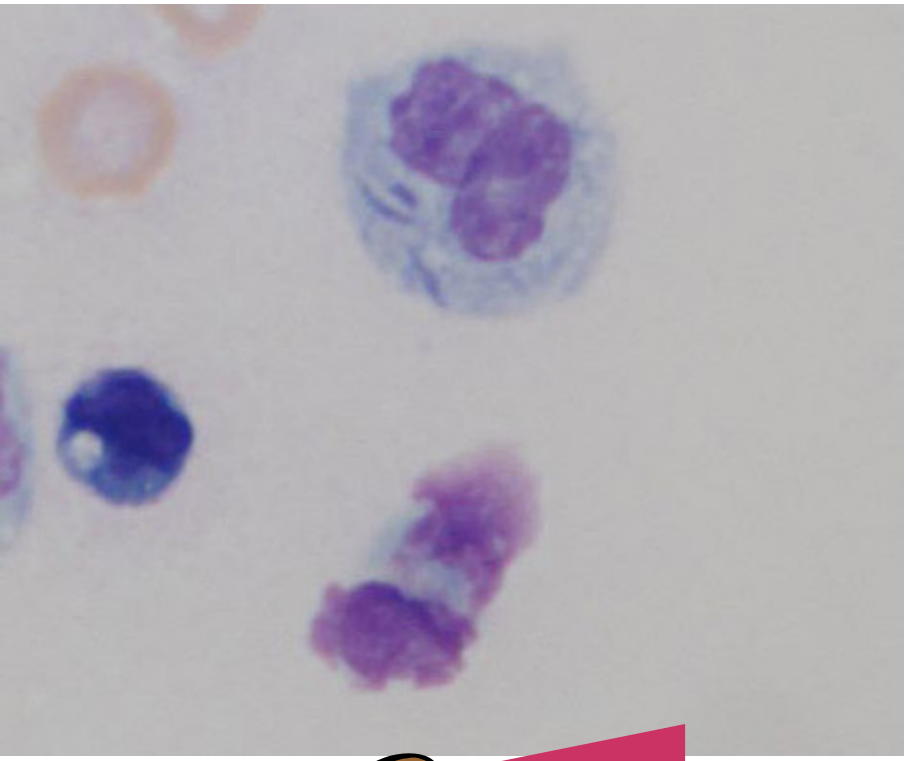
- Pulmonary or mediastinal lesions
- Surgical treatment
  - HR: 6.97
  - 95% CI: 2.16-22.46
  - Likelihood ratio test: $p<0.001$

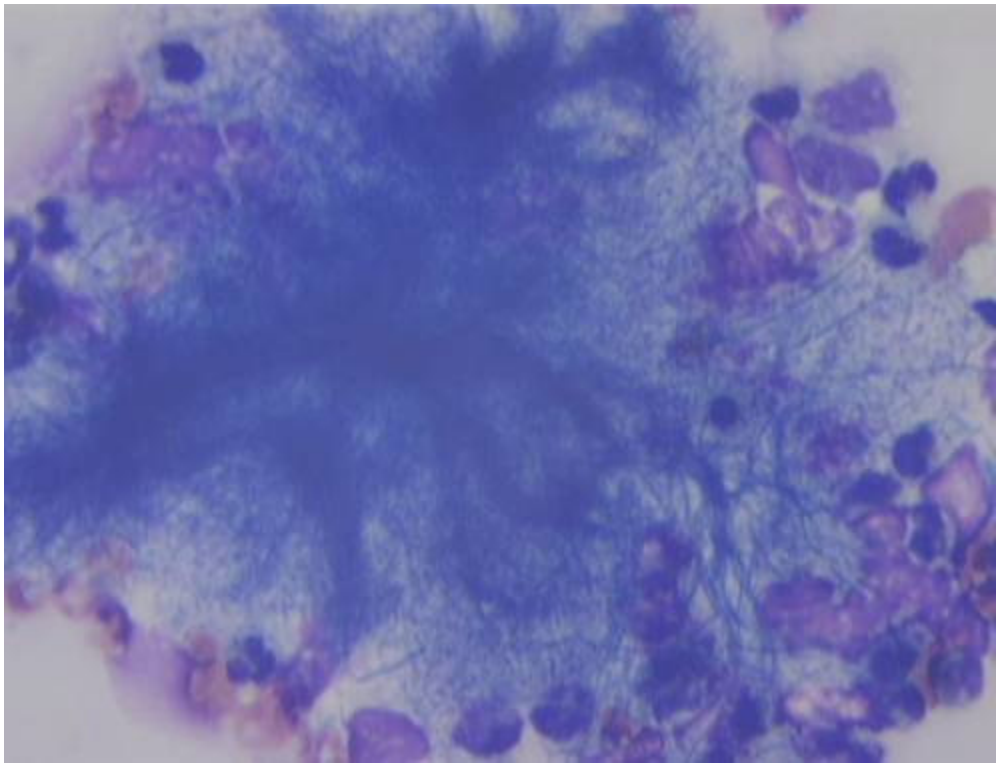
Pyothorax

- Cultures of *Actinomyces spp*
- Surgical treatment
  - HR: 4.96
  - 95% CI: 1.56-15.78
  - Likelihood ratio test: p=0.004

Medical treatment

Surgical treatment





Pyothorax: Medical

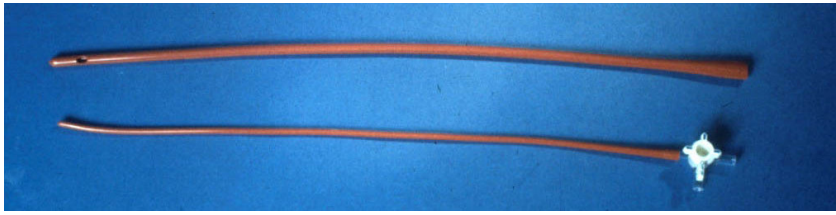
- Thoracostomy tube
- Antibiotherapy
- Fluidotherapy
- Oxygenotherapy
- Blood work

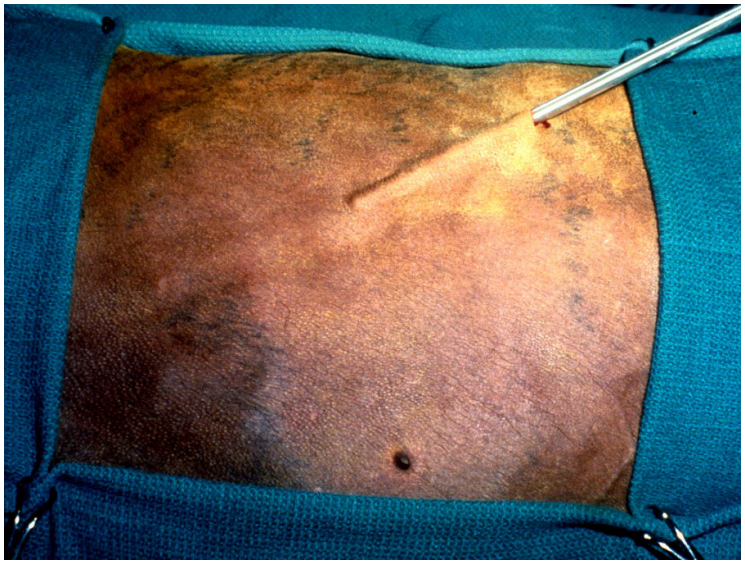
Pyothorax: Medical

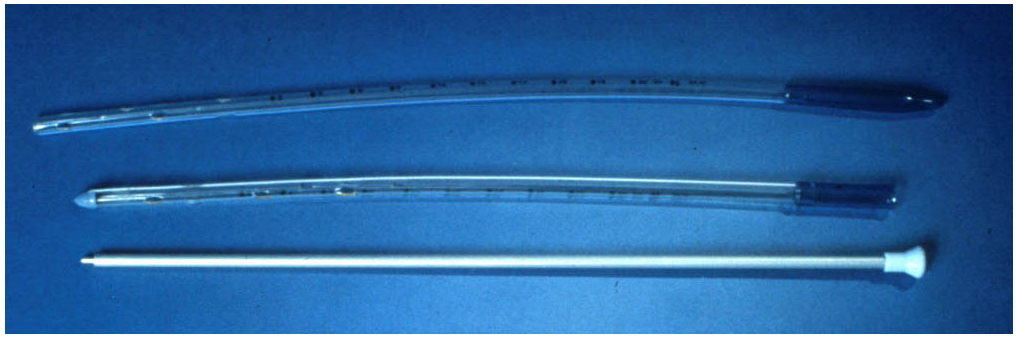
- Blood work
  - CBC
    - Inflammatory reaction
  - Biochemistry
    - Liver and kidney functions
  - Coagulation profile

Pyothorax: Medical

- Thoracostomy tube
  - General anesthesia
  - Local anesthesia







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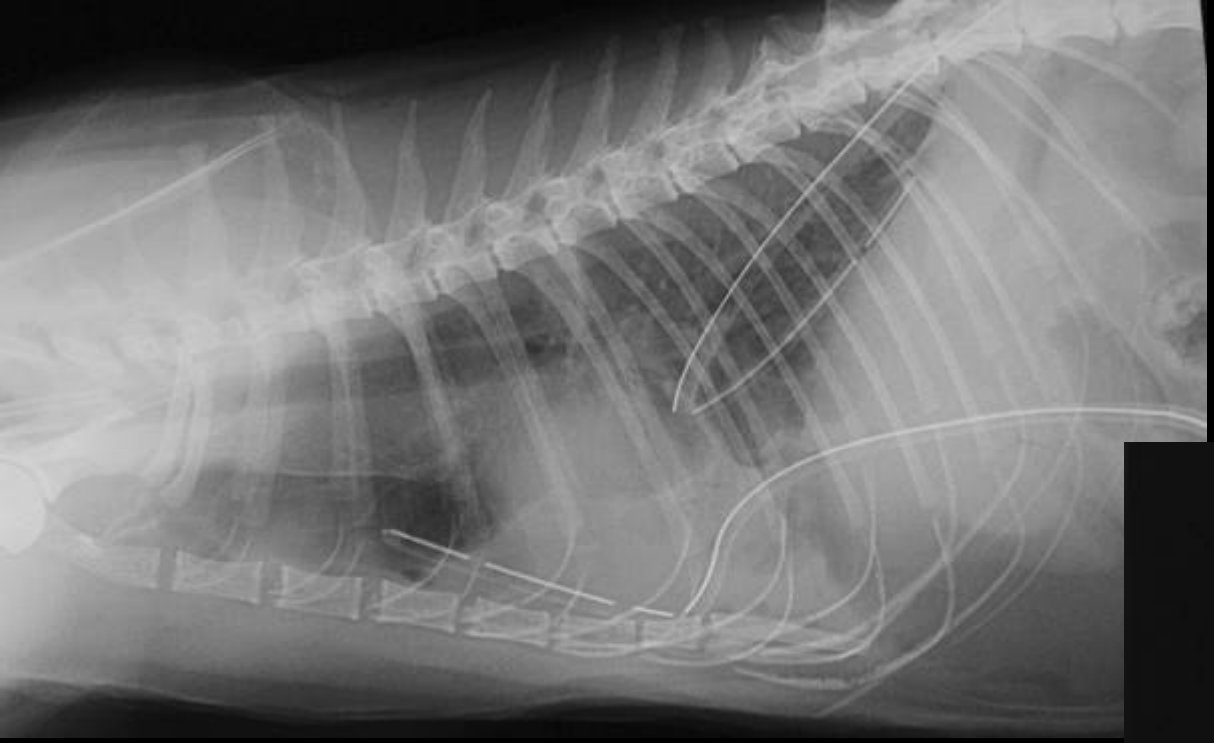
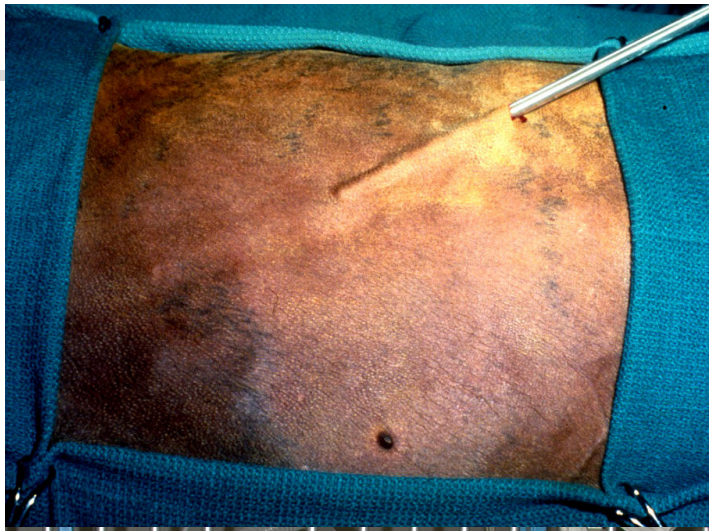
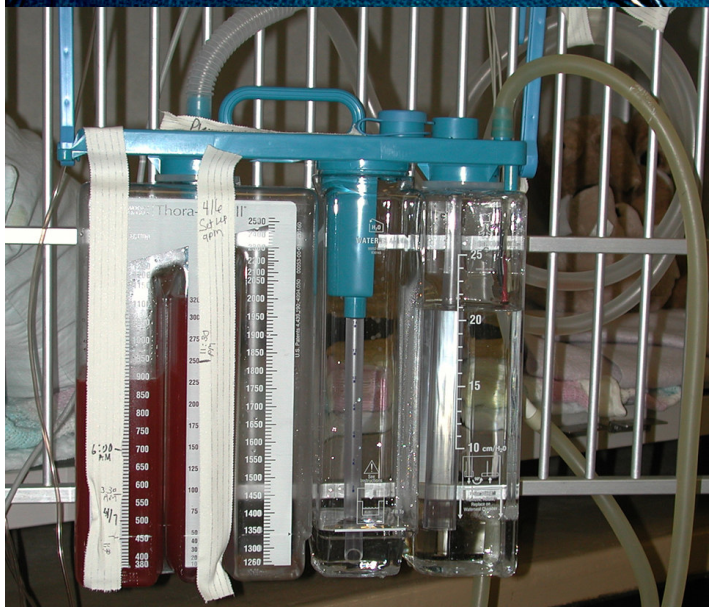


Pyothorax: Medical

- Thoracostomy tube
  - Continuous suction
  - Pleural lavage



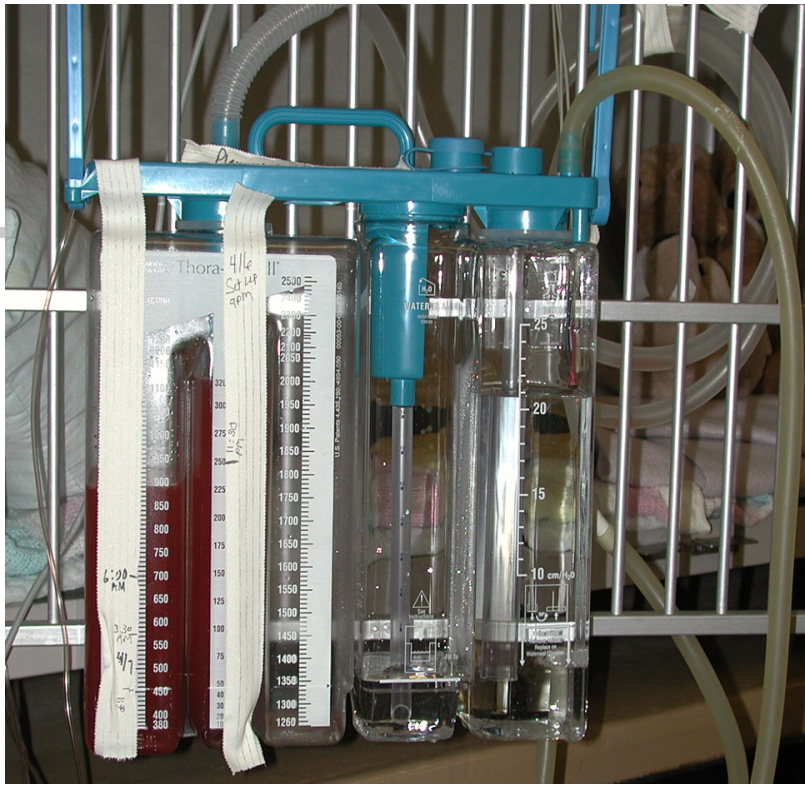


Pyothorax: Medical

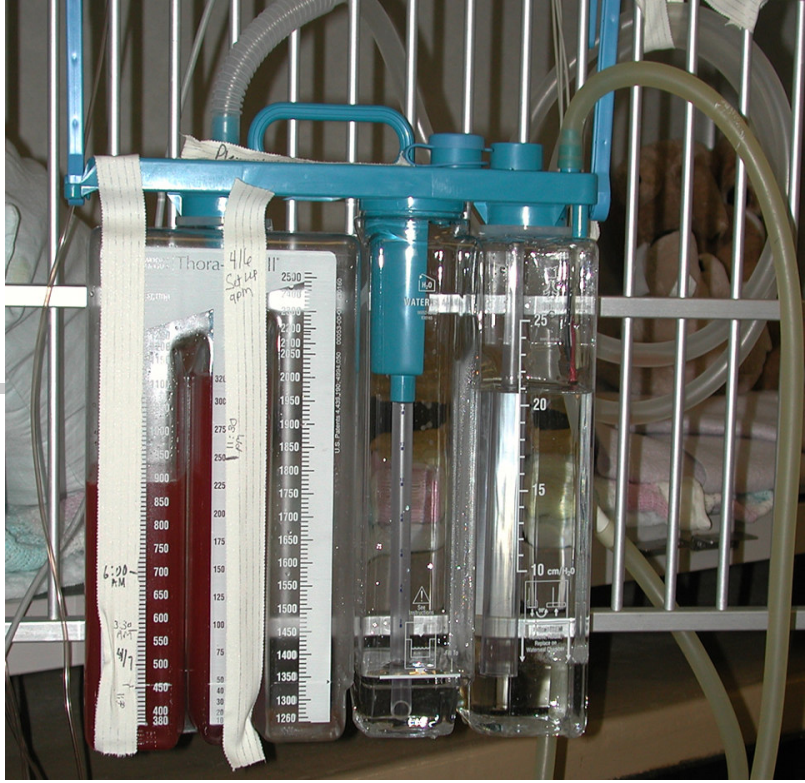
- Thoracic lavage
  - 20 ml/kg of warm isotonic solution
  - 1 hour
  - 4 times a day

Pyothorax

- Fluid therapy
  - Crystalloids
  - Colloids
    - Oncotic pressure
    - Hetastarch 20 ml/kg/day
    - Albumin



Pyothorax



- Fluid therapy
  - Plasma
    - Coagulation factors
  - Blood
    - Hemoglobin
    - Oxygen carrying capacity
    - Lactate

Pyothorax: Medical

- Complete Blood Count
  - Inflammatory reaction
- Biochemistry
  - Liver and kidney functions
- Coagulation profile

Pyothorax

- Culture-Sensitivity

	Dog	Cat
Aerobic bacteria		
	E coli	Pasteurella
	Klebsiella	
Anaerobic bacteria		
	Peptostreptococcus	Peptostreptococcus
	Bacteroides	Bacteroides
	Fusobacterium	Fusobacterium
	Actinomyces	Actinomyces

Pyothorax: Medical

- Broad spectrum antibiotics
  - Cefoxitin: 20 mg/kg IV three times a day
  - Ampicillin Enrofloxacin
    - Ampicillin: 20 mg/kg IV three times a day
    - Enrofloxacin: 5-10 mg/kg IV two times a day

Pyothorax: Medical

- Monitor progression
  - Blood work
  - Cytology of fluid
    - Cell count
    - Degenerative neutrophils
    - Bacteria
      - Intracellular / extracellular

Pyothorax: Medical

- Reduction of cell count
- No degenerative neutrophils
- No bacteria
- Fluid production is reduced
  - Tolerated by patient

Pyothorax: Medical

- Culture sensitivity
- Remove chest tube

Pyothorax: Medical

- Broad spectrum antibiotics
  - 4 to 6 weeks

Pyothorax

- Decision to convert to surgery
  - Failure of medical treatment
  - Septic
  - Mass on radiographs
  - Actinomyces

Pyothorax: Surgery

- Compromised patient
- Reduction of oxygen delivery

Pyothorax: Surgery

- Respiratory function
  - Fluid in thoracic cavity
  - Atelectasia
- Cardiovascular function
  - Septic
  - Vasodilation
  - Decrease contractility

Pyothorax: Surgery

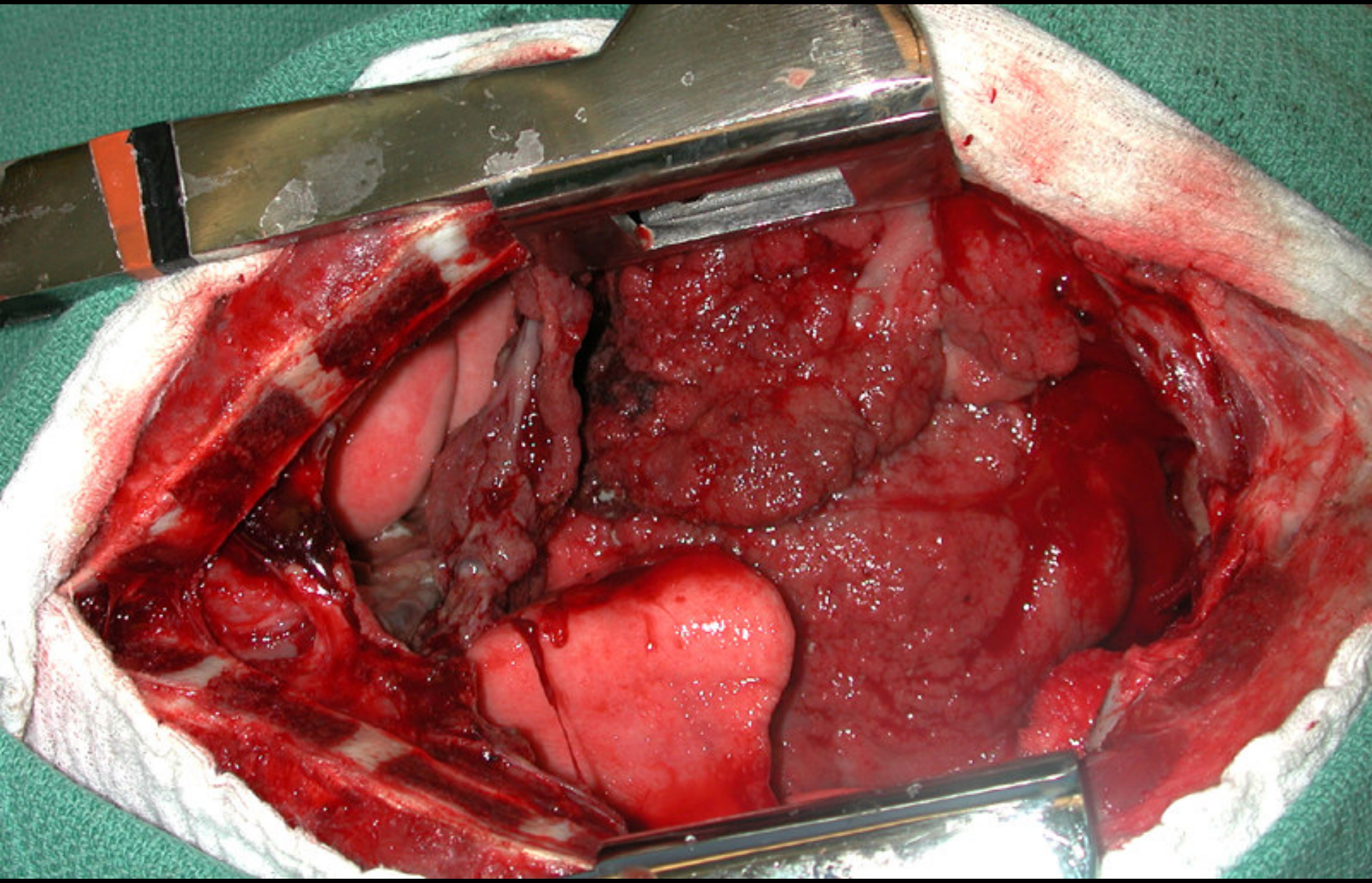
- Respiratory function
  - Oxygen therapy
  - Drain thoracic cavity

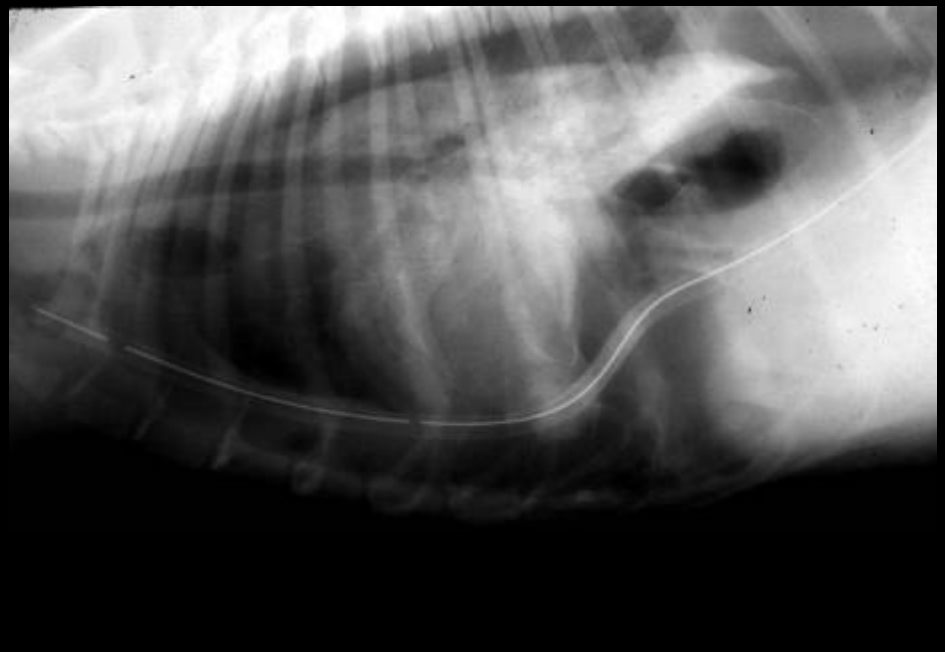
Pyothorax: Surgery

- Cardiovascular function
  - Volume loaded
    - Crystalloids
    - Colloids
    - Blood products
  - Inotropic support

Pyothorax: Surgery

- Median sternotomy



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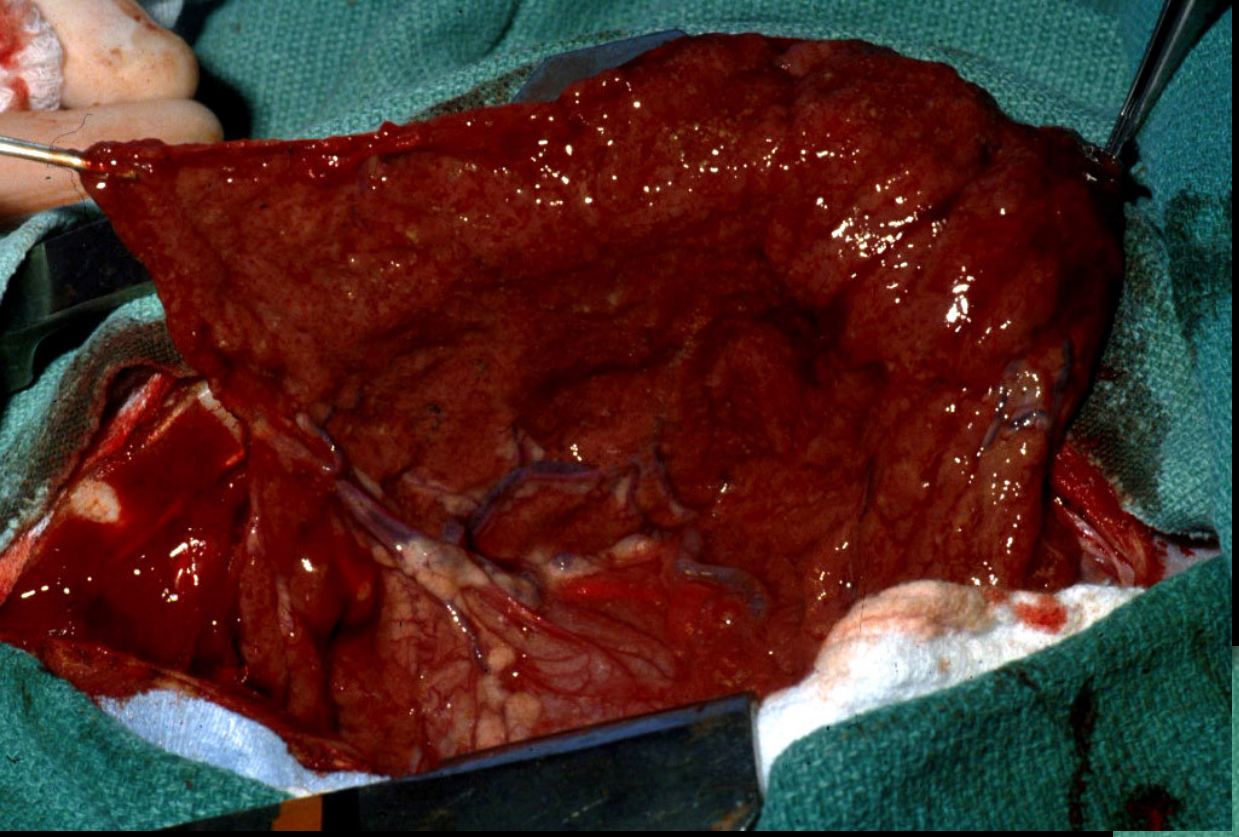
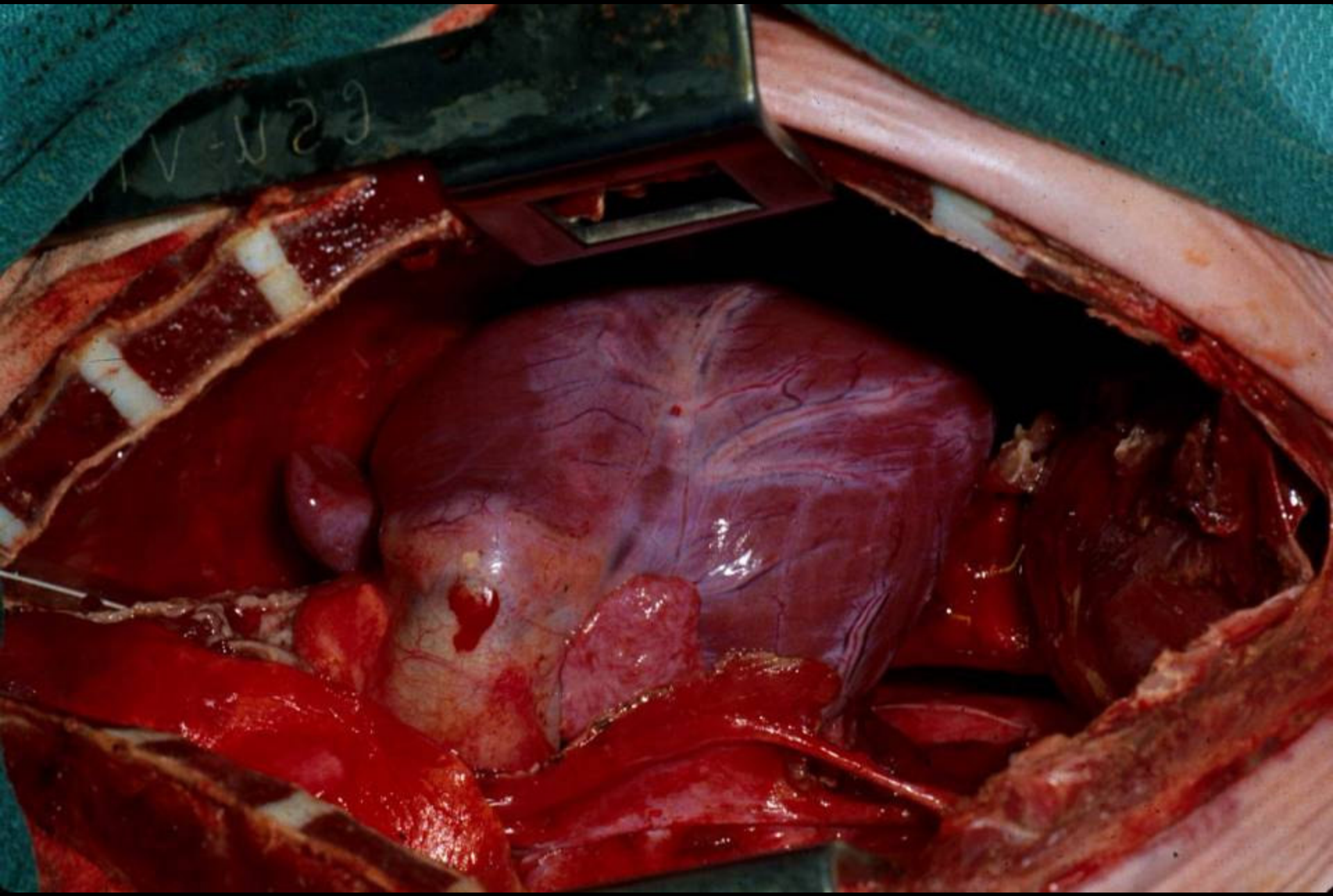
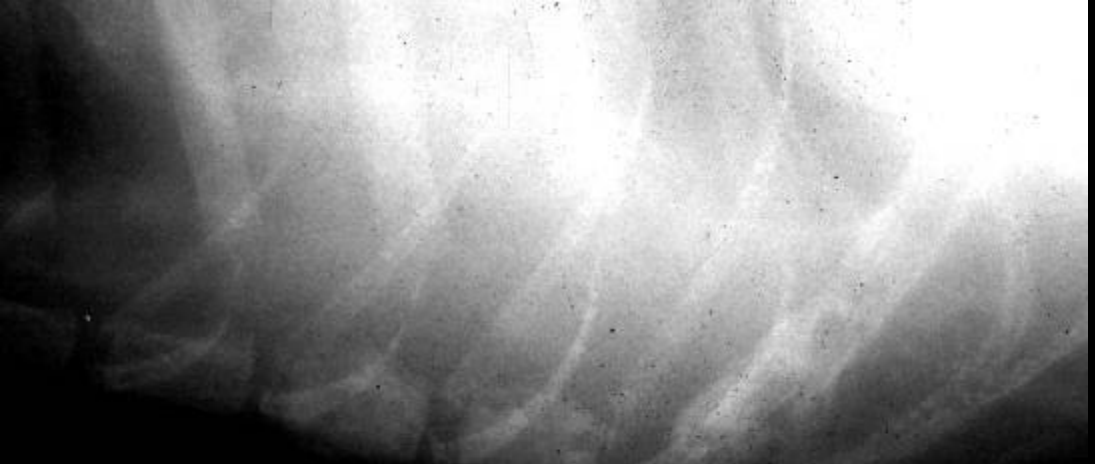
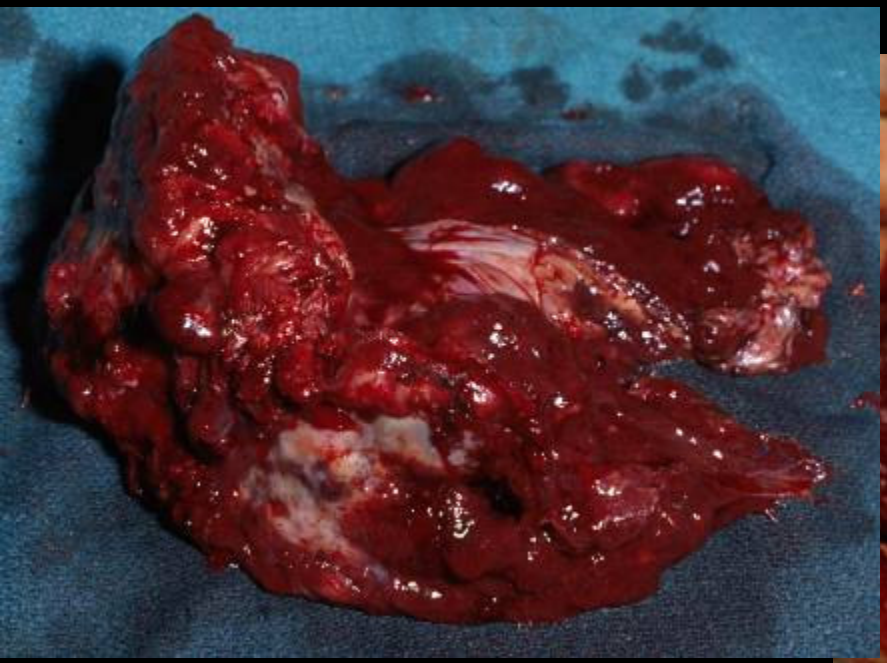
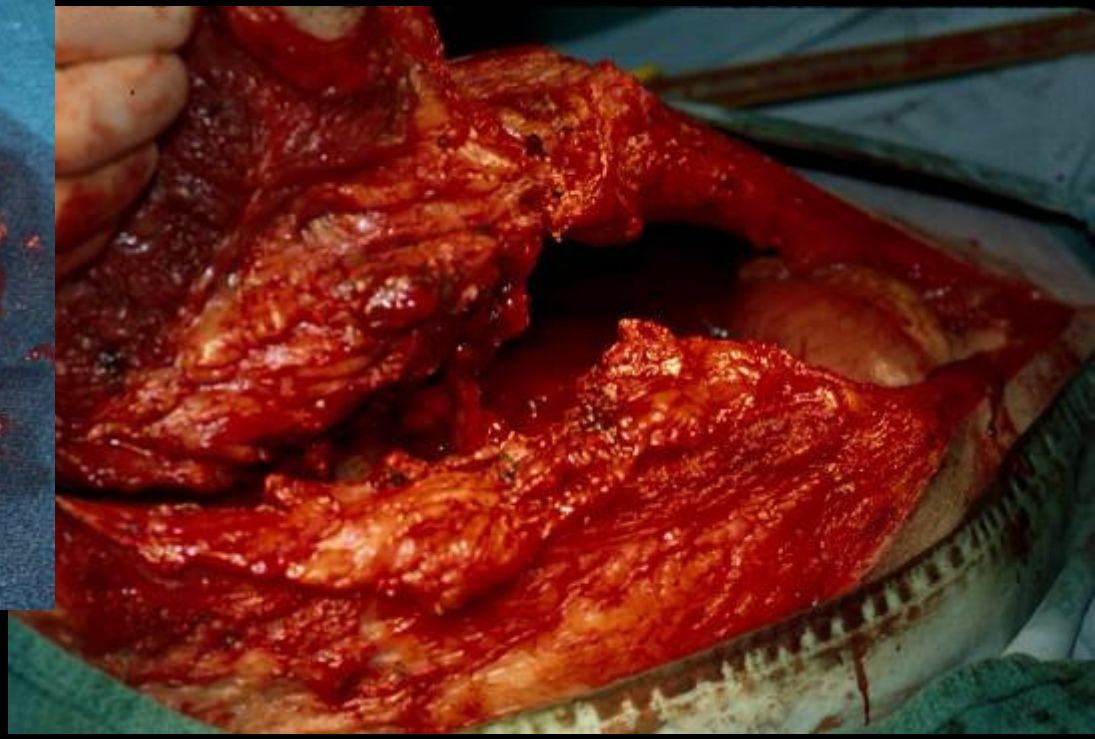




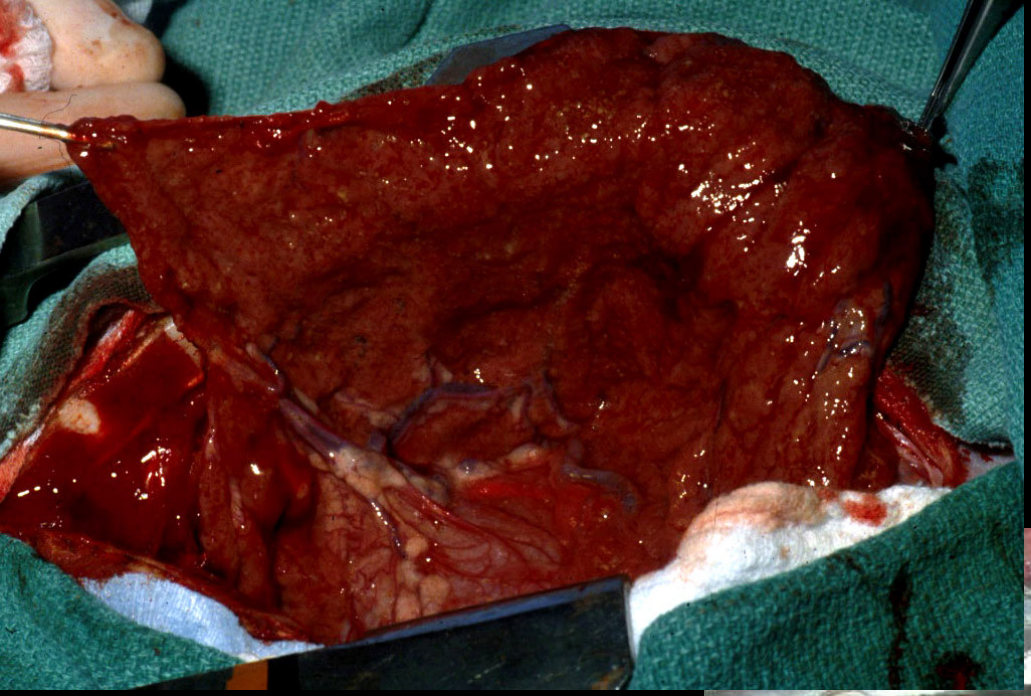


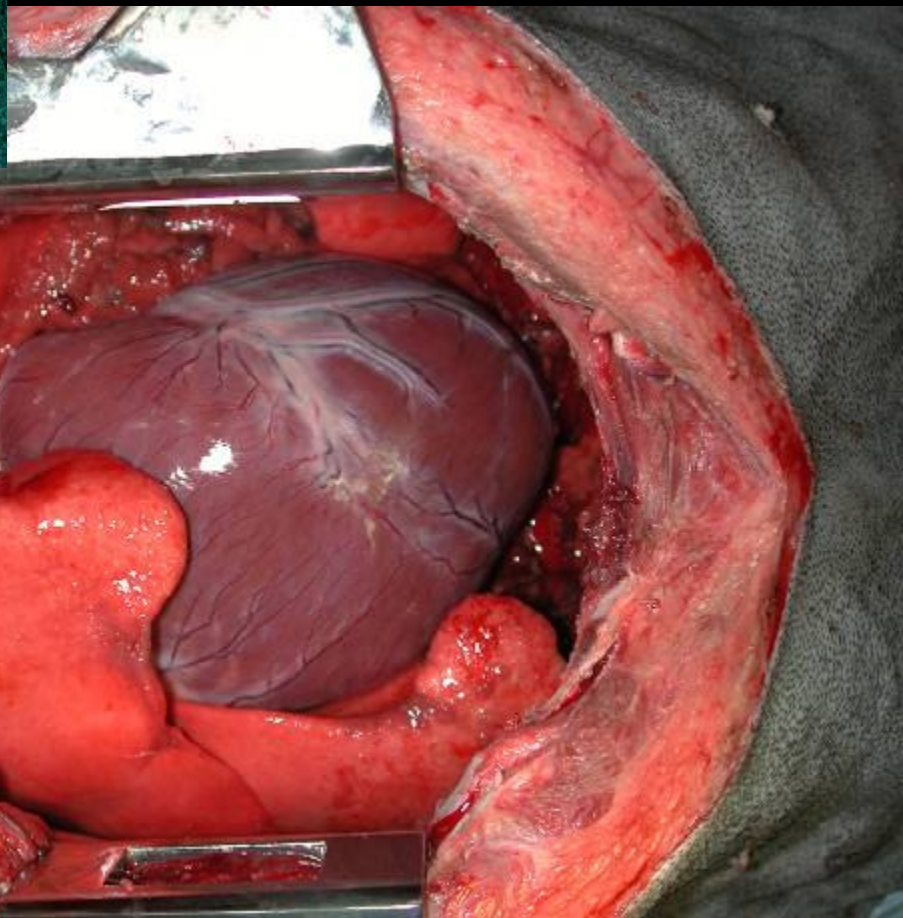




Pyothorax: Surgery

- Constrictive pleuritis
- Chronic
- Fibrin deposition
- Limit expansion of lungs
- Decortication
- Lung re-expansion

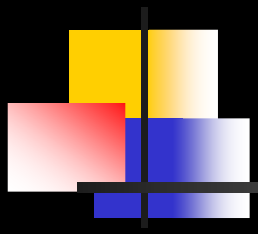




Pyothorax

QuickTime™ and a
Sorenson Video decompressor
are needed to see this picture.

- Thoracoscopy
  - Acute pyothorax ?
  - Evaluate the patient
  - Biopsy/Cultures
  - Debridement
    - More efficient drainage and lavage



Pyothorax

- Thoracoscopy
- Debridement
- Culture -
- Actinomyces cytology

- Thoracoscopy + thoracotomy
- Pericardectomy
- Pyogranulomatous pleuritis and pericarditis
- Actinomyces
- Bacteroides
- Corynebacterium

Pyothorax

- Continuous suction
- Lavage
- 5 days in hospital
- Clindamycin
  Enrofloxacin

- Continous suction
- Lavage
- 3 days in hospital
- Clindamycin
  Enrofloxacin

- Rooney et al JAVMA 2002 26 dogs
- 6.6 +/- 3.3 days in hospital
- 4.3 +/- 1.6 days in CCU post surgery

Pyothorax/Empyema

- American Thoracic Society
  - Exsudative
  - Fibrinopurulent
  - Organizing

Pyothorax/Empyema

- Fibrinopurulent
  - Adhesions
  - Loculations
  - Thick pus

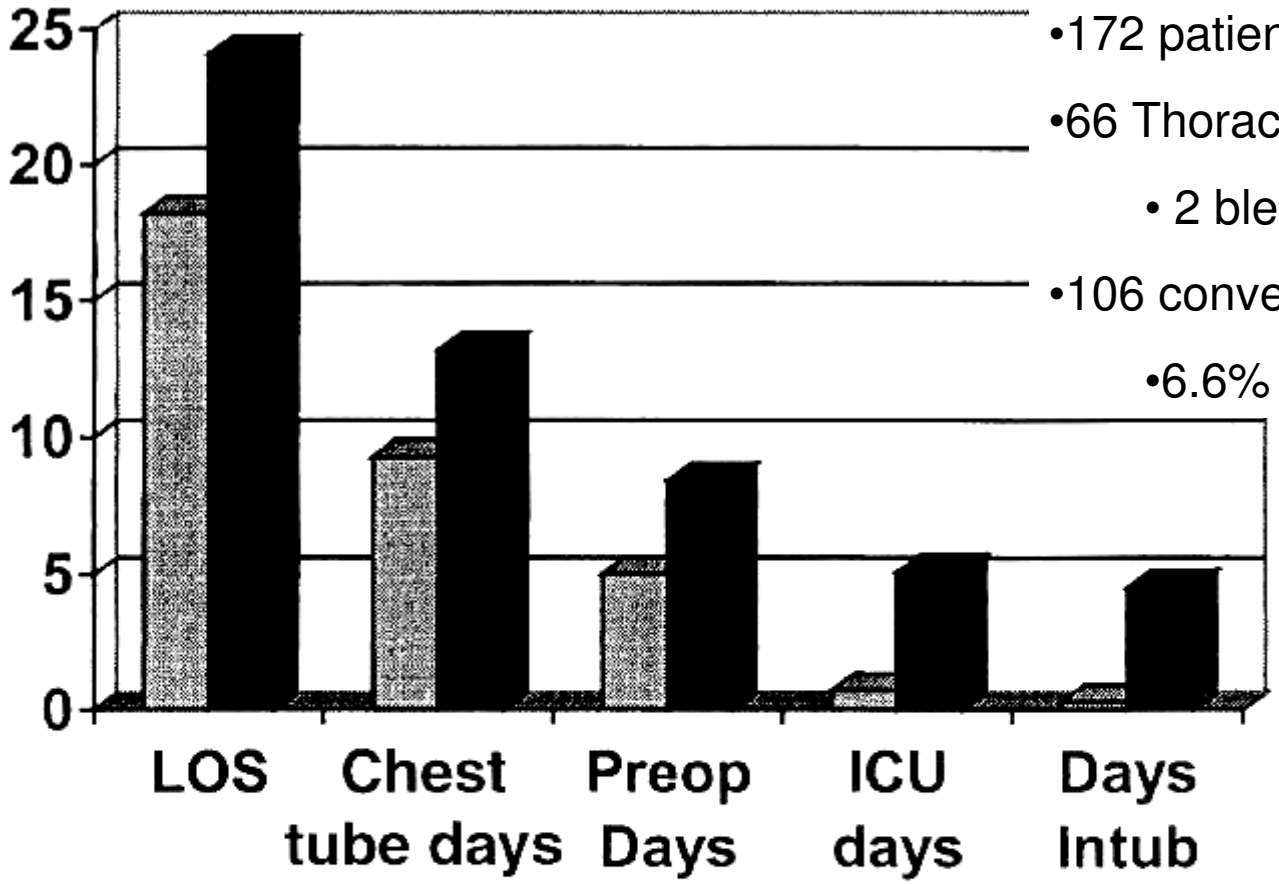
  - Thoracostomy tube
  - Thoracotomy
  - Thoracoscopy

Pyothorax/Empyema

- Organizing phase
  - Thick fibrous tissue
  - Thoracotomy or thoracoscopy
  - Decortication

Pyothorax/Empyema

- Thoracoscopy
  - Acute phase
  - Chronic phase
    - Decortication
    - Adhesion
    - Single port thoracoscopy
      - JPS 2004 10 patients 7 years old



- 172 patients
- 66 Thoracoscopy alone
  - 2 bleeding 2nd surgery
- 106 converted to thoracotomy
  - 6.6% mortality rate

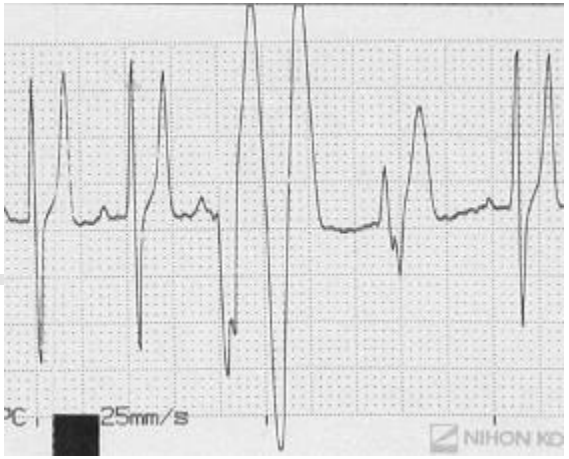
Fig 1. Results of analysis of hospital data for patients who underwent thoracoscopic decortication (grey bars) *and those who underwent open thoracotomy* (black bars). *The y-coordinate indicates numbers of days for length of stay* (LOS), *use of chest tube days, preoperative period* (Preop days), *intensive care unit* (ICU days), *and intubation* (Days Intub). *The difference in preoperative days was highly significant* ($p = 0.015$).

Roberts at al: MIS in the treatment of Empyema: Intraoperative decision making. ATS 2003

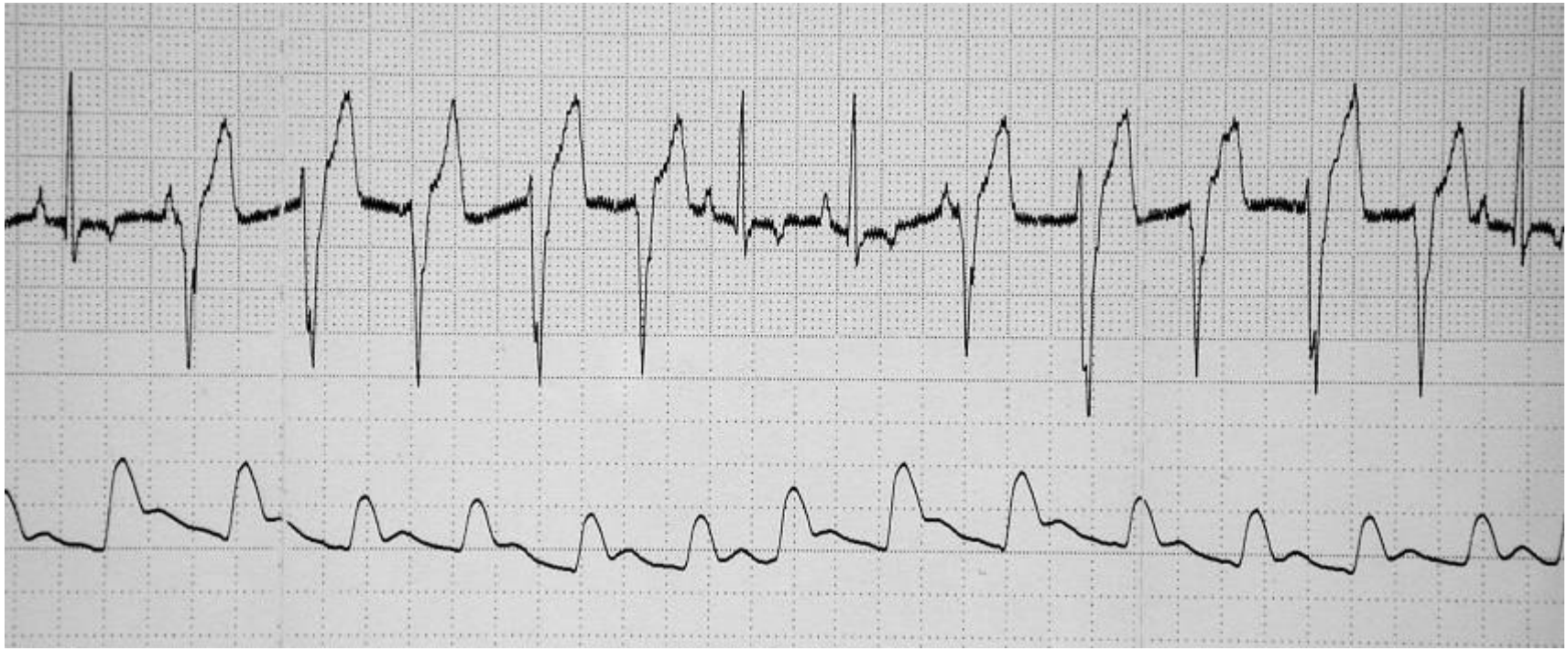
Pyothorax: Surgery

- Inotropic support
  - Dobutamine
    - 2 to 6 microgm/kg/min IV
  - Epinephrine
    - 0.1 to 0.4 microgm/kg/min IV

Pyothorax: Surgery



- Electrocardiogram
  - Ventricular tachycardia



Pyothorax: Surgery

- Lidocaine
  - Bolus IV 1 to 2 mg/kg
  - 50 to 100 microgm/kg/min IV
- Procainamide
  - Bolus IV 10 mg/kg
  - 25-50 microgm/kg/min IV

Pyothorax: Surgery

- Colloids
  - Plasma
  - Coagulation factors
- Whole blood transfusion

Pyothorax: Surgery

- Pain medication
  - Fentanyl: 2 to 6 microgm/kg/hr IV
  - Intrapleural lidocaine-bupivacaine
    - 1.5 mg/kg of each

Pyothorax: Surgery

- Disseminated intravascular coagulation
  - Activated coagulation time
  - ATIII
  - Prothrombin time
  - Platelet count
  - Fibrinogen Degradation Products

Pyothorax: Surgery

- Disseminated intravascular coagulation
  - Heparin
    - 100 UI/kg SQ three times a day
    - 30 UI/kg in plasma 30 min prior to administration
  - Plasma

Pyothorax

- Thoracocenthesis
  - Drainage
  - Lavage
    - Twice daily
    - 20 ml /kg of warm sterile saline

Pyothorax

- Fluid therapy
- Electrolyte imbalance
- Acid base imbalance

Pyothorax

- Antibiotherapy for 6 to 8 weeks
- Cytology
- Radiographs

Pyothorax

- Surgery recommended for dogs (Rooney JAVMA 2002)
  - Failure time: 209 days vs 61 days
  - Actinomyces
  - Lung mass/abscess

Pyothorax

- Cats (Waddell, JAVMA 2002)
  - 80 cats
  - 66.1 % survived
  - Medical treatment except 5 cats
  - Hypersalivation
  - Low heart rate

Pyothorax

- 9 Hunting dogs (Piek Vet Quaterly 2000)
  - 100% survival
  - No actinomyces
  - No foreign body

Pyothorax

- 36 Dogs/14 cats (Demetriou, JSAP 2002)
  - 10 cases: Surgical treatment:
    - Mass on US
    - Failure of medical treatment
    - 4 foreign bodies
    - 2 Lung abscess
    - No etiology in 3: cats
  - Success rate 86%

Pyothorax

- Pleural effusion (Mellanby, JSAP 2002)
  - Pyothorax 13 cases Dogs
  - Success: 7/8 cases treated
  - Surgery: 3 dogs
    - Grass awn 1 dog

Pyothorax

- Very challenging pathology
- Medical and surgical treatment
- Thoracoscopy