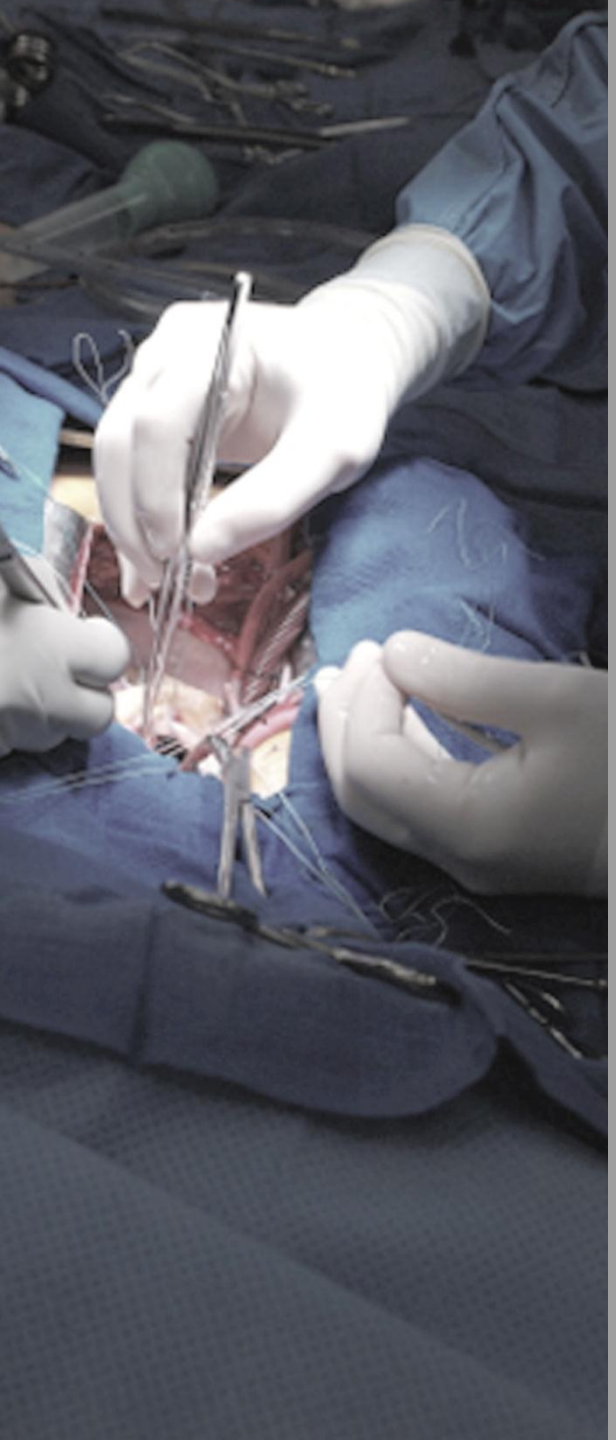


Posttraumatic Empyema Thoracis

Dr AG Jacobs

STEVE BIKO ACADEMIC HOSPITAL,
UNIVERSITY OF PRETORIA

EMPYEMA THORACIS

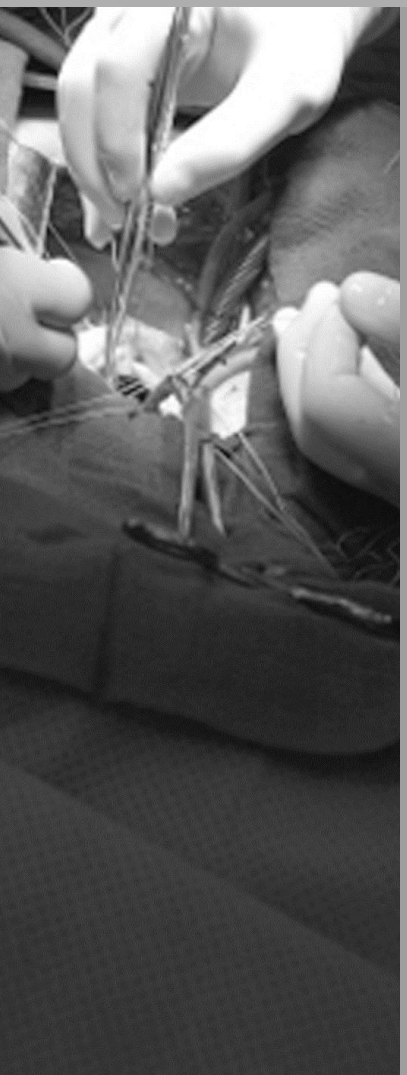
Derived from Greek word

empyein

Means pus-producing

Refers to accumulation of pus within the pleural space

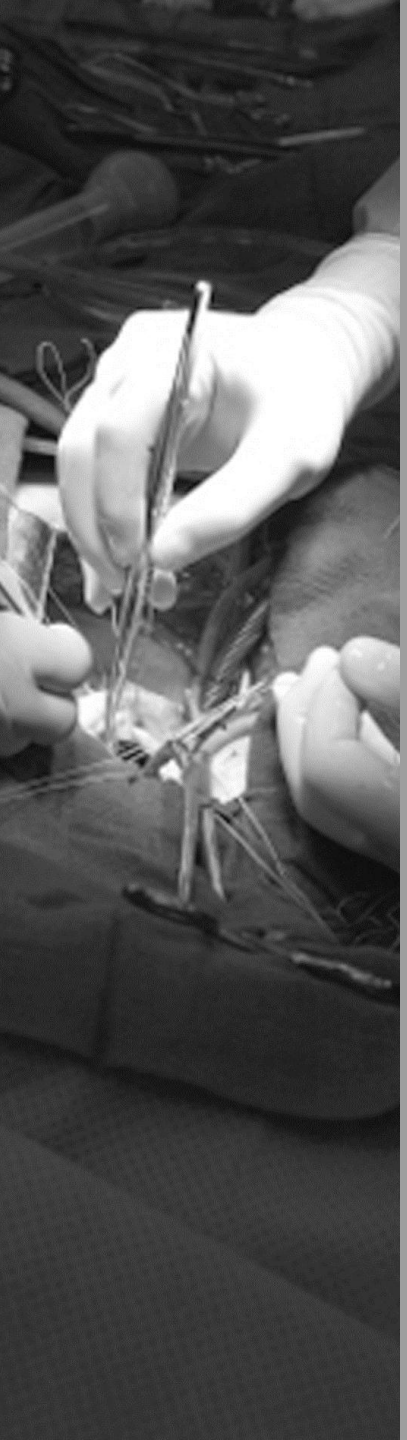
POST TRAUMATIC EMPYEMA THORACIS (ET)



Hippocrates **600BC** advocated drainage

Can be consequence:

- Penetrating
- Blunt
- Iatrogenic Trauma



Mostly further management not required, other than intercostal drain insertion

Risk factors development Empyema:

- Alcoholism
- HIV
- Drug usage
- Pre-existing lung disease

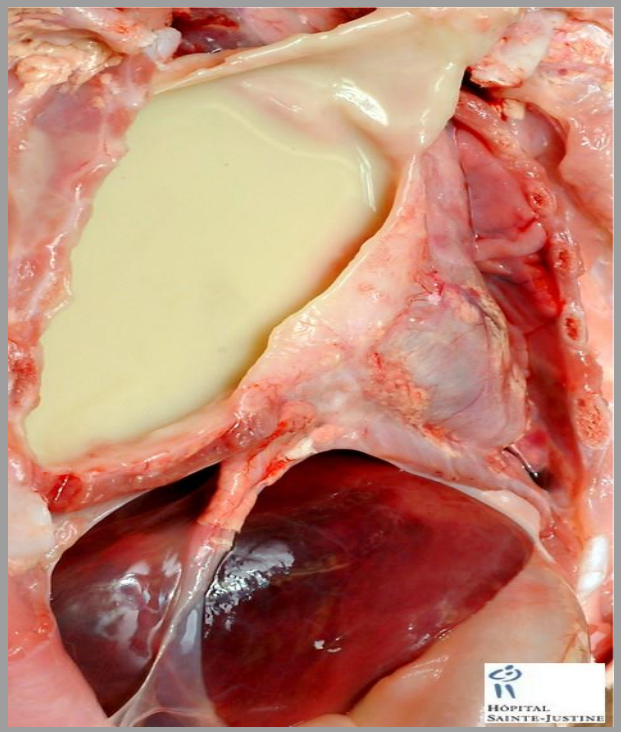
PATHOGENESIS

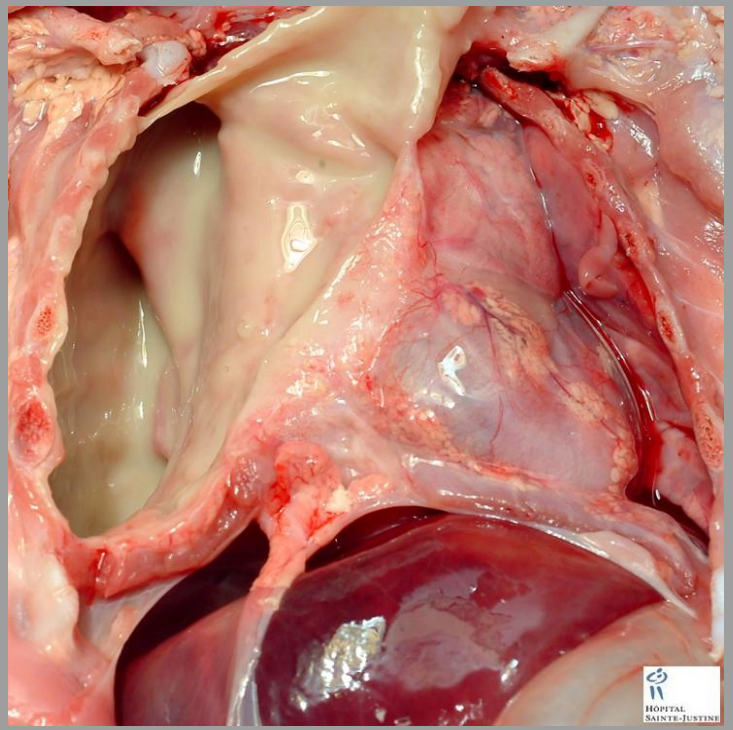
Most commonly consequence of parapneumonic process

American Thoracic Society divides ET into 3 evolutionary stages

STAGE	PATHOLOGY	EVOLUTION
I. Exudative/Acute	Protein-rich sterile fluid Low cellular count	0 - 2 weeks
II. Fibrinopurulent	Bacterial invasion of fluid Polymorphs Activated coagulation & fibroblastic activity	1 - 6 weeks
III. Organized phase	Thick pus Thick inelastic peel over pleua	5 weeks

PATHOGENESIS





•Intrabdominal source

TRAUMA SETTING

Disruption of pleural space

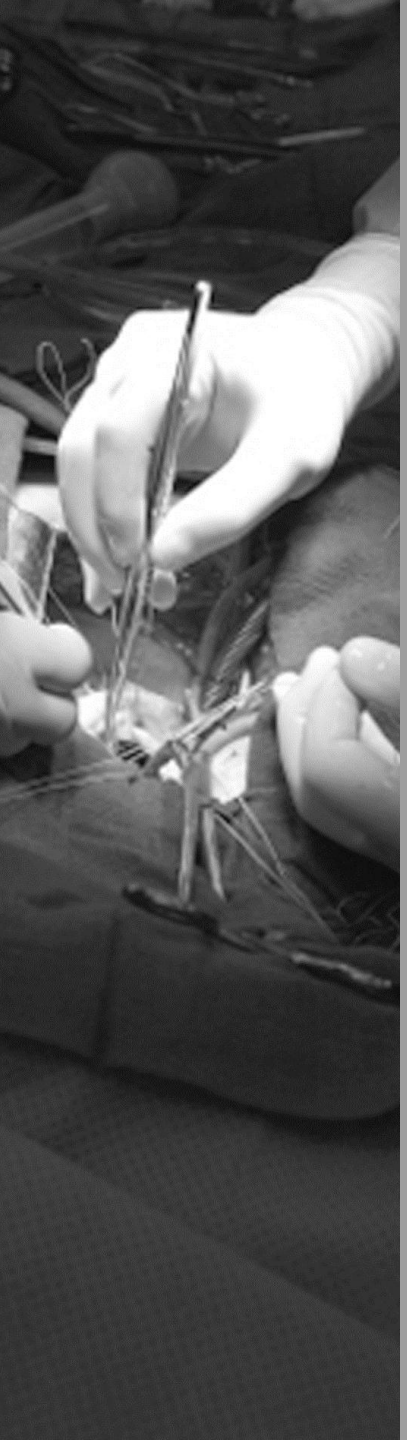
↓

Blood in pleural space

↓

Contamination of space from:

- Injury
- Pneumonia
- Intrabdominal source
- ICD



ET does not develop in all cases of simple inoculation of pleural space

More common in severely injured patient

- Monocyte & neutrophil dysfunction
- Anti-inflammatory cytokine release
- Resulting in state of relative immunosuppression

FACTORS PREDICTIVE OF DEVELOPMENT OF POSTTRAUMATIC EMPYEMA

- Ventilated patient
- Splinting secondary to pain
- Pulmonary contusion
- Onset of pneumonia
- Abdominal hollow viscus injury
- Shock
- Intercostal drain
- Penetrating injury (Gunshot > Stab wound)

MICROBIOLOGY

- Staph aureus - most common organism
- Incidence ranging from **35 -75%** (Aguilar et al 1997, Mandal et al 1998)
- Different from post infectious empyema – Streptococcus
- Anaerobes & other gram neg organisms (Klebsiella, Pseudomonas) increasing in frequency
- More common in thoracoabdominal injuries
- No growth from fluid → up to **35%**

CLINICAL PRESENTATION

Fever → Chills → Chest pain

↓

Dyspnoea → Tachypnoea → Leucocytosis

↓

Raised CRP

Acute Phase

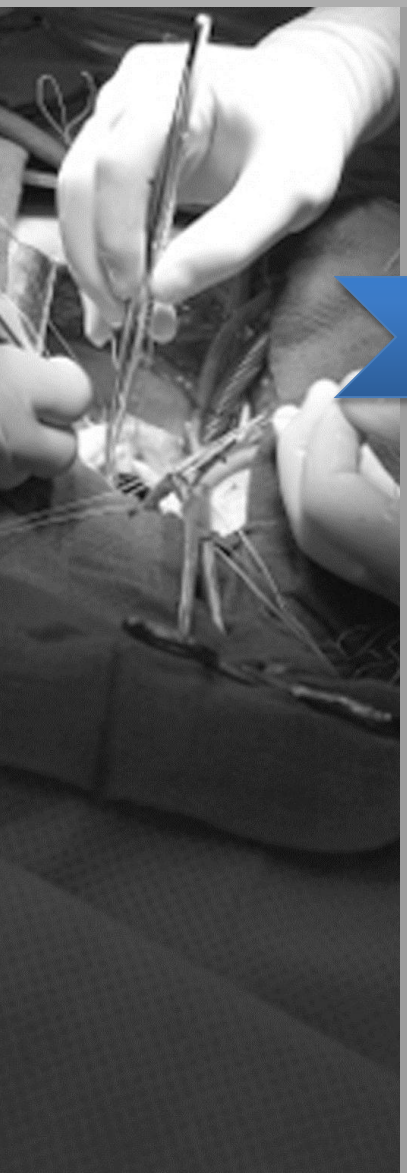
EMPYEMA NECESSITANS

Late presentation

Fistulous connection between pleural Collection & skin

Posttraumatic may discharge onto skin where chest wall originally breached

DIAGNOSIS



Made on characteristic clinical features:

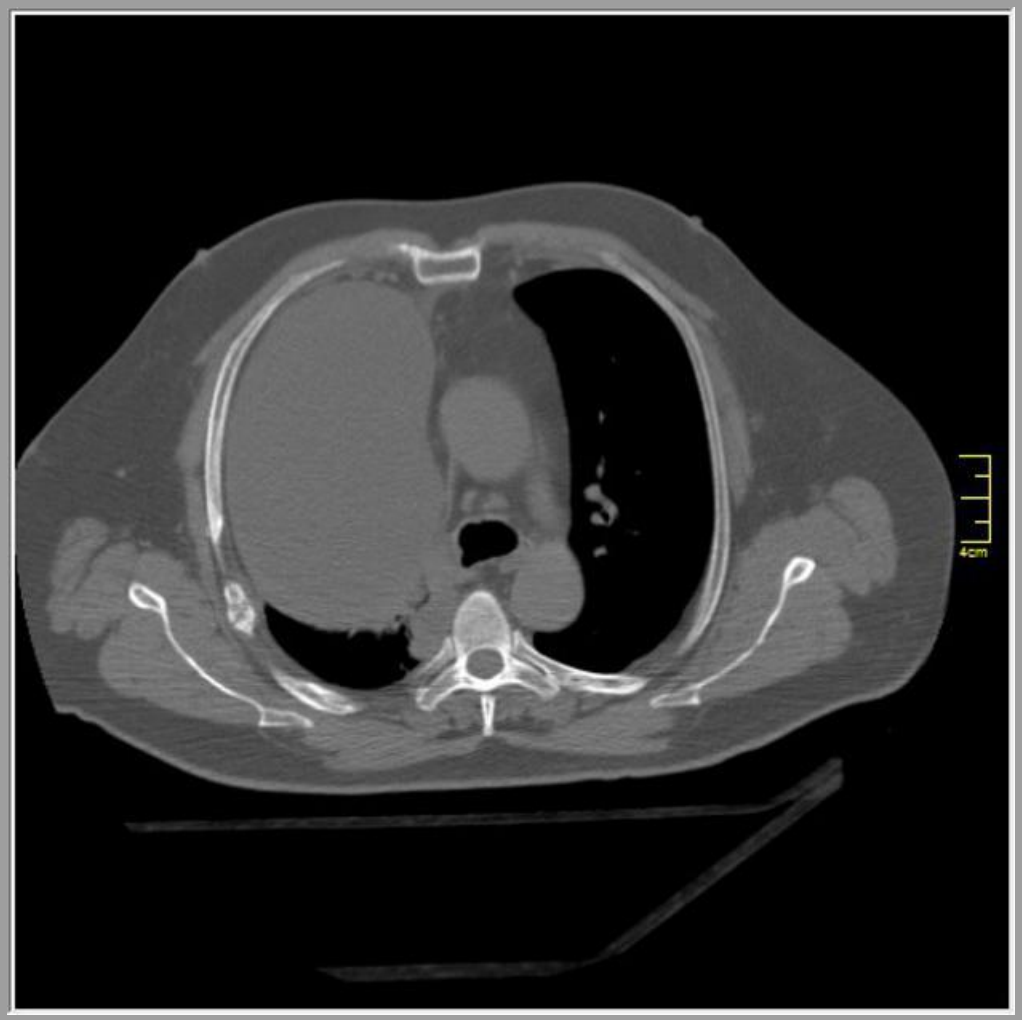
Symptoms → Signs of hydrothorax

CXR → CT Chest

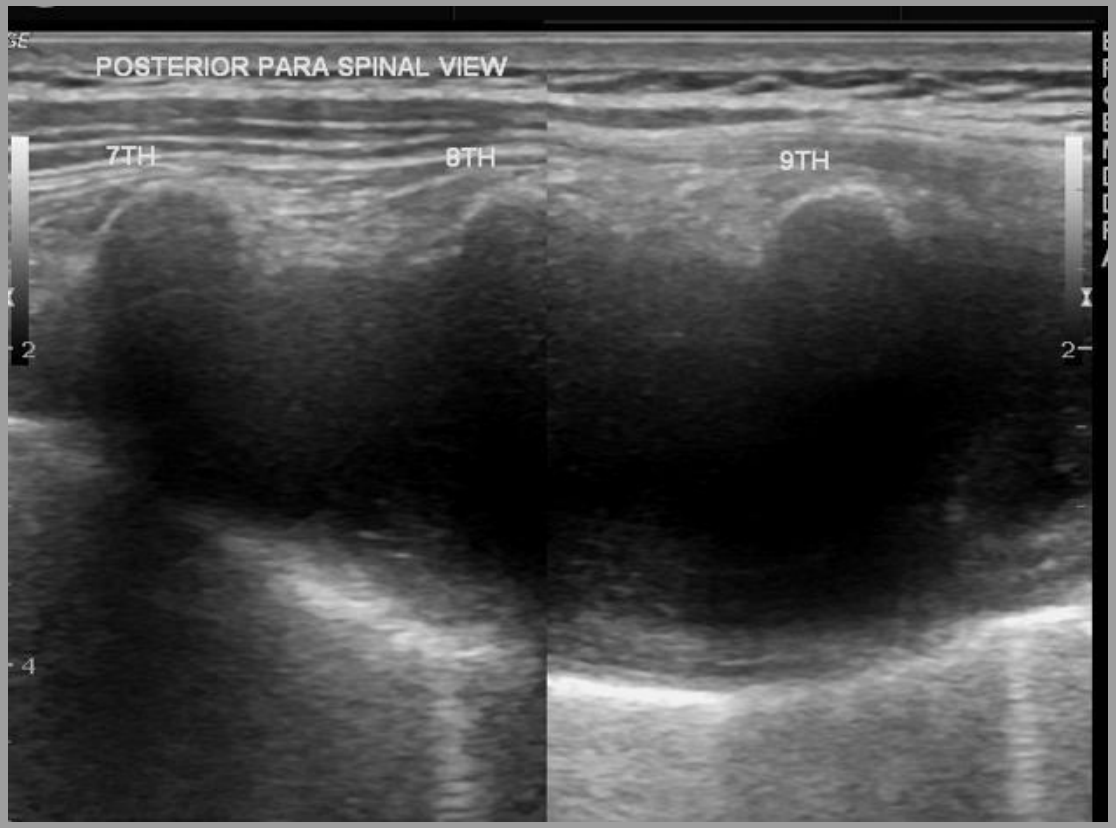
Ultrasonography → Diagnostic Thoracentesis

CXR

CT CHEST



ULTRASONOGRAPHY



DIAGNOSTIC THORACENTESIS

Gold standard of diagnosis

Following suggests Empyema:

- Presence of frank pus
- Organism on Gram Stain or culture
- *Biochem:*
  - High protein < 30 mg /dl
  - PH < 7.2
  - LDH > 1000iu/l
  - Glucose < 5mg /dl

TREATMENT

Empyema thoracis still a substantial challenge because of resultant long time in hospital, great expense and at times disappointing results

Principle of management of ET

Ubi pus evacua

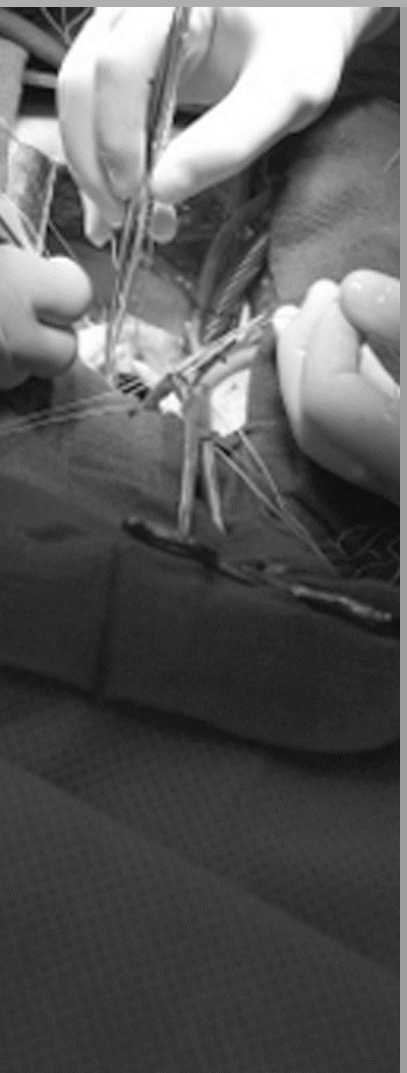
"If you find pus, remove it"

TREATMENT

The aim is to:

- Eliminate the pus
- Re-expand the lung
- Restore the mobility of chest wall and diaphragm
- Improve pulmonary function
- Eliminate complications of chronicity

ANTIBIOTIC THERAPY FOR EMPYEMA THORACIS



Antibiotics an essential requirement

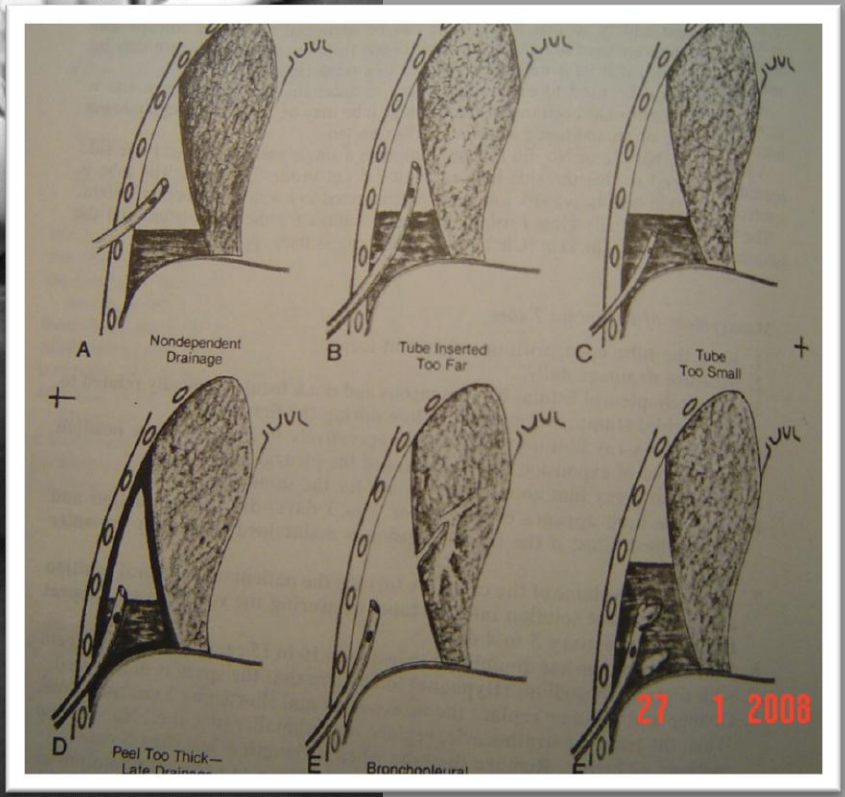
Antibiotic choice based on gram stain or culture or on local epidemiological data

Should have good pleural fluid/empyema penetration:

- Penicillin
- Clindamycin
- Ceftriazone
- Vancomycin
- Metronidazole
- Ciprofloxacin

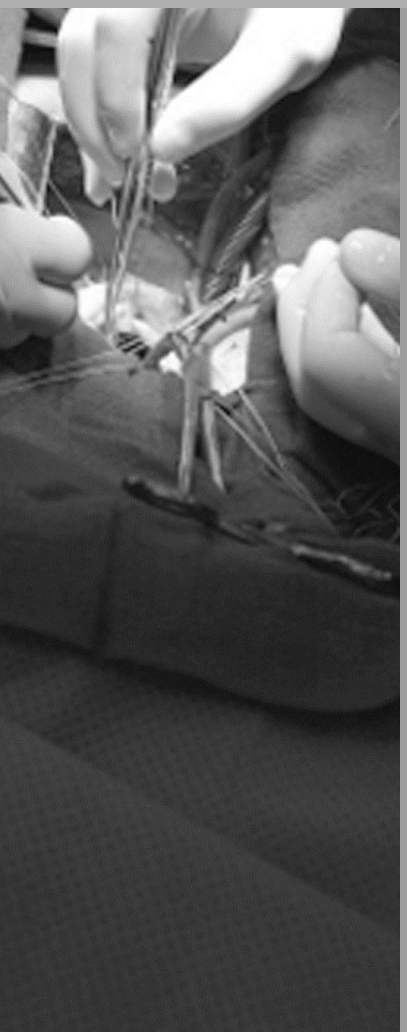
Aminoglycosides best avoided - poor penetration

INTERCOSTAL TUBE DRAINAGE (ICD)



- First line intervention
- Aim – Evacuate pus
- Allow expansion of lung
- Large bore drain (>28F)
- Dependant part of pleural collection

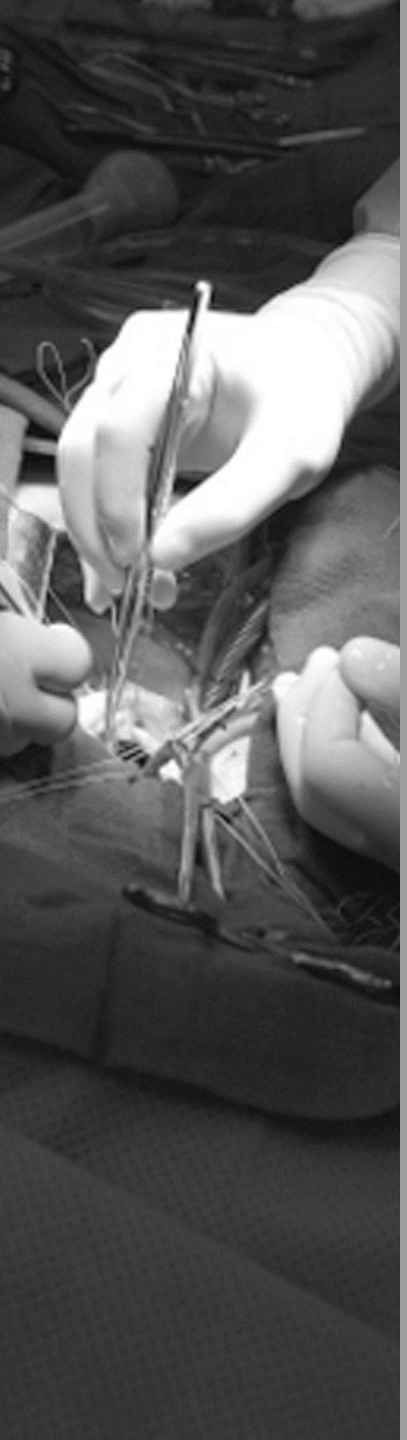
INTERCOSTAL TUBE DRAINAGE (ICD)



Simple placement of ICD – known risk factor for developing posttraumatic empyema with incidence of **2 - 16 %**

RISK FACTORS

- Experience of Medical Personnel
- Setting in which tube inserted
- Number of tubes
- Deviation of tube drainage
- Incomplete evac of blood

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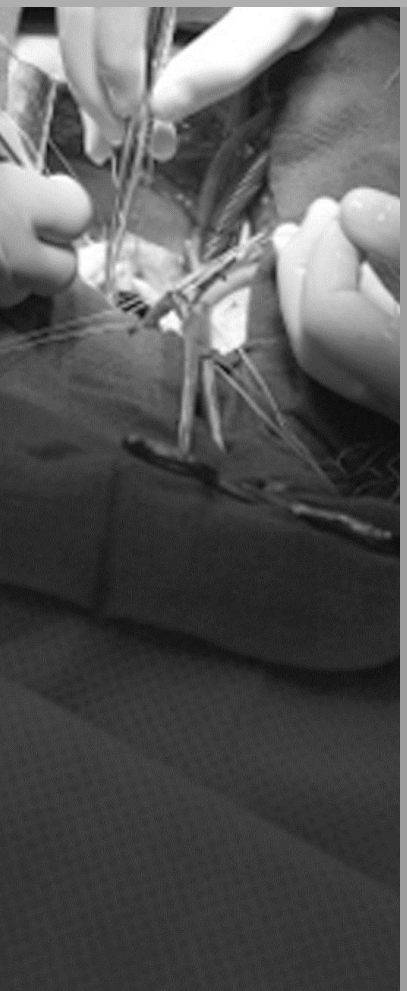
USE OF PROPHYLACTIC ANTIBIOTICS POST DRAIN INSERTION

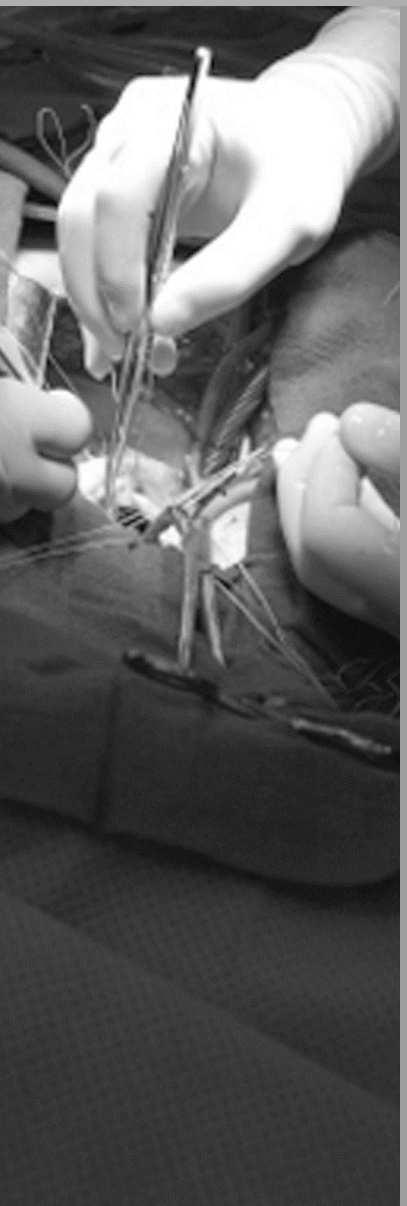


- Ideally administered before the procedure
- Unequivocally been shown to decrease incidence of infectious complications after abdominal surgery
- Several authors have tried to address role of prophylactic antibiotics in patients requiring ICD

EAST – Eastern Association for Surgery of Trauma

Insufficient published evidence to support use of prophylactic antibiotics

MAXWELL ET AL (2004)



Designed multicentre trial

Prospective double blind study

Ran for 39 months

Able to obtain only 20% cases for sufficient analysis

CONCLUDED

Incidence of development of empyema small

Does not seem to reduce risk of development of empyema

Study under powered to draw any definitive conclusions

BOSMAN ET AL 2012

Systematic literature search to identify randomized clinical trials on antibiotic prophylaxis in ICD placement for thoracic trauma

Included 11 articles, encompassing **1241** ICD in **1234** patients

Patients who received prophylactic antibiotics had **3 times lower** risk of empyema thoracis

GONZABO & HOLEVAR

- Prospective, randomized study
- Small no - **142** patients with isolated chest trauma
- **71** Placebo
- **71** Cefazolin
- No infections in Antibiotic group
- **4** in Placebo group

CONCLUDED: Although complication rate was low it was statistically significant

FIBRINOLYTICS

The use and installation of fibrinolytic agents Streptokinase & Urokinase is appealing

They activate plasmin through cleavage of plasminogen

- Initiate degradation of fibrin
- Reduce viscosity of fluid
- Dissolve loculations
- Dissolve peel

FIBRINOLYTICS

Reported success rate of intrapleural fibrinolytic agents vary from **71% - 90%** (Robinson, 1994, Jerges-Sanchez 1966) However most pertain to post infectious empyema.

Cameron et al (2004) examined the published studies for the Cochrane database and concluded – was insufficient evidence to recommend their use.

MIST Study UK - No difference between Saline and Streptokinase installation, in terms of treatment failures, need for surgery or mortality

FIBRINOLYTICS

CONCLUSION

The role of fibrinolytics in setting of post traumatic empyema should be further studied.

Cannot currently be recommended as routine therapy:

Prohibitive cost

Limited evidence of efficacy

VATS

- Proven favourable decrease in morbidity compared to open thoracotomy in other diseases
- Increasingly being used in field of trauma
- Early evacuation of hemothoraces shown to effectively decrease development of posttraumatic empyema
- Therefore most efficient use of VATS is in prophylaxis, evacuating the hemothorax before development of an empyema
- Review of literature indicates that successful intervention with VATS for posttraumatic empyema is dependant on timely intervention with the aim of evacuating retained collections after trauma

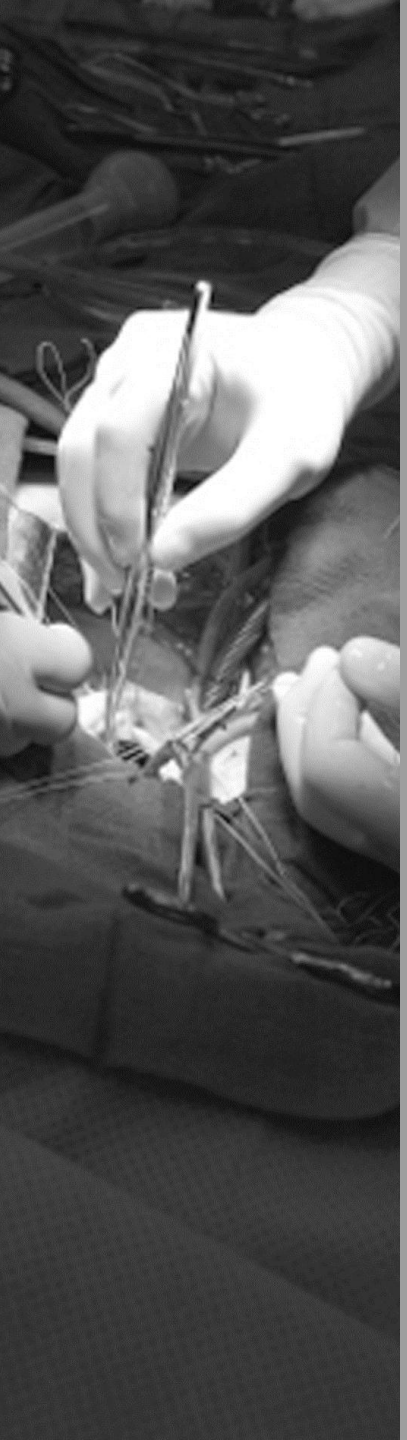
VATS

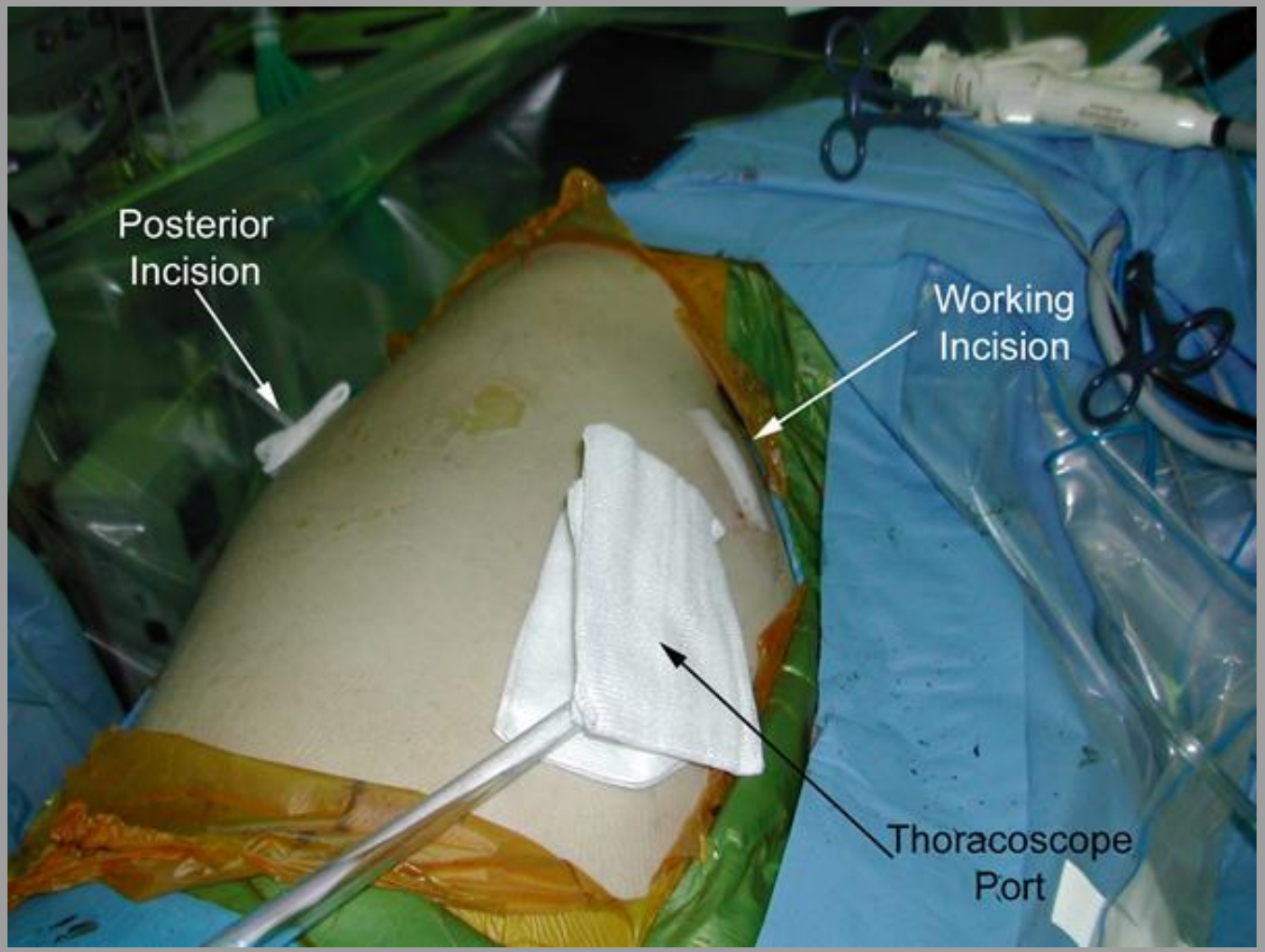
VATS has Limitations

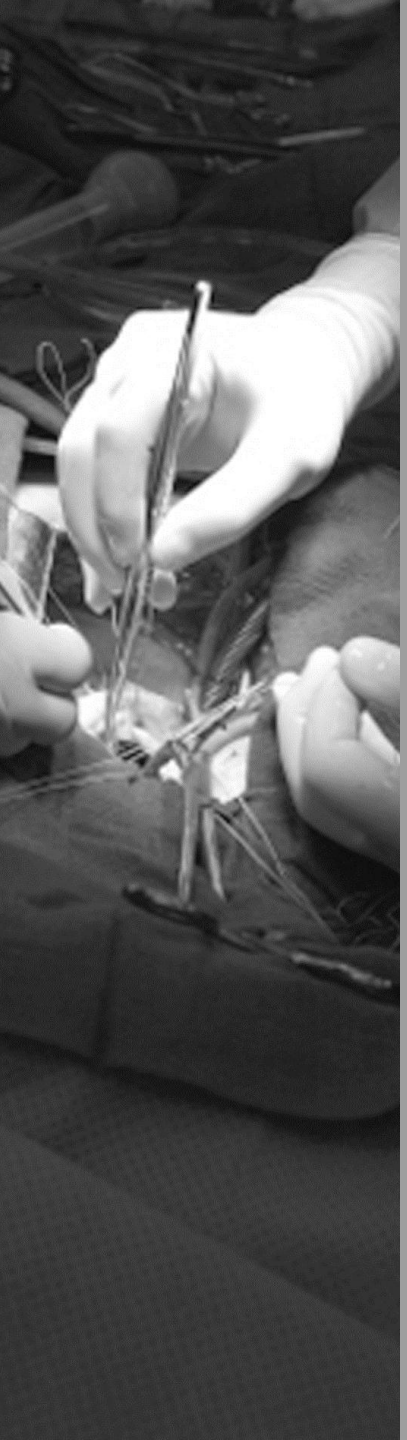
Need for:

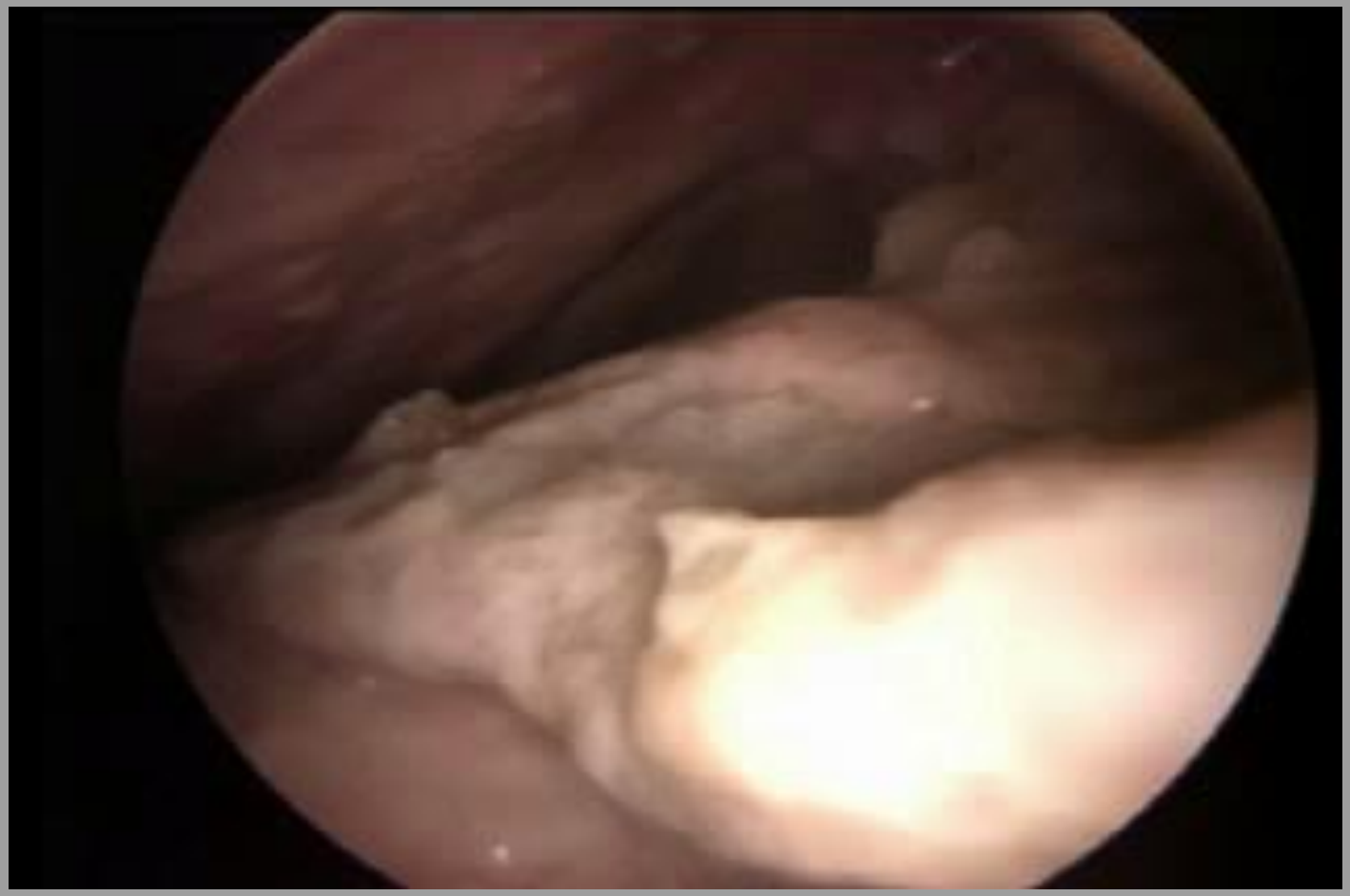
- Expertise
- Special instruments
- Single lung ventilation

Most effective in Stage I and early Stage II disease




Posterior
Incision
Working
Incision
Thoracoscope
Port

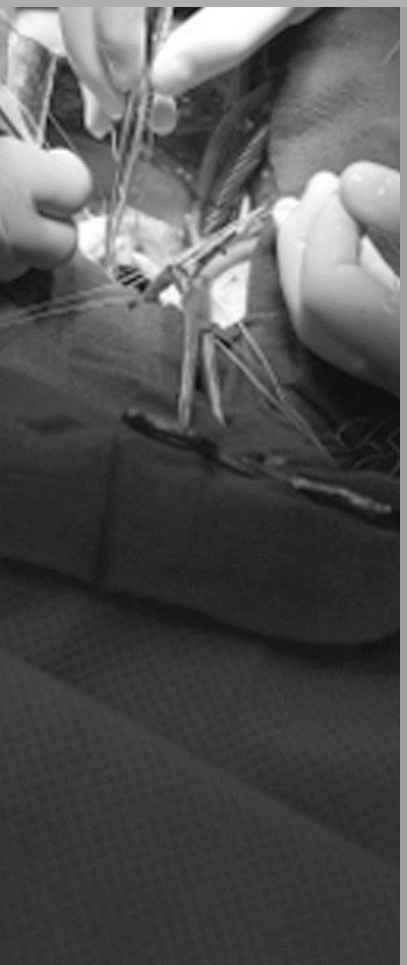




Open drainage

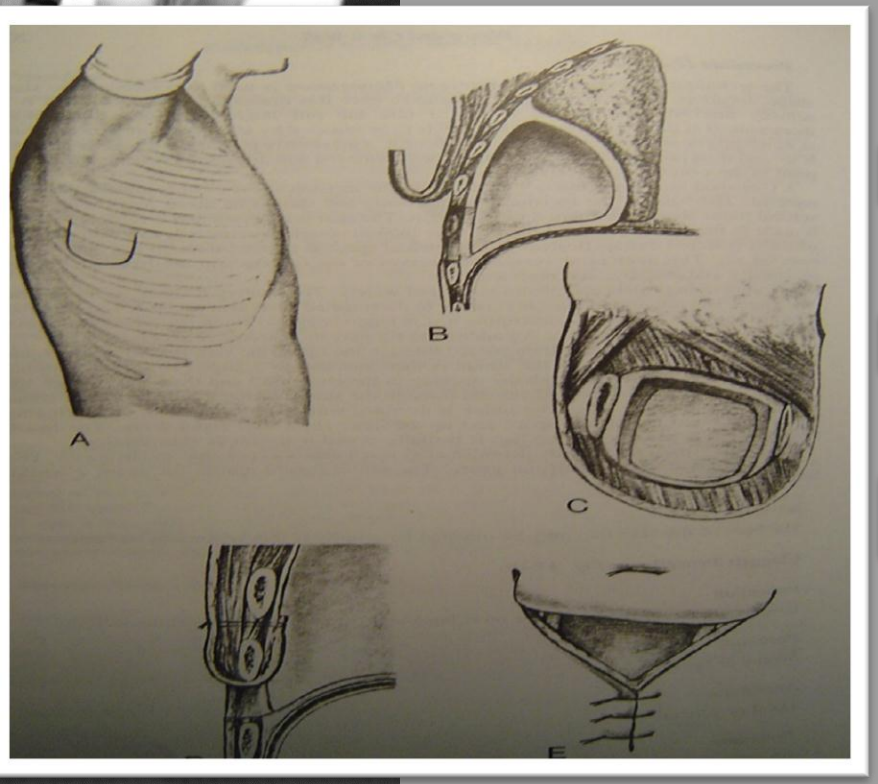
Reserved for debilated patient

RIB RESECTION



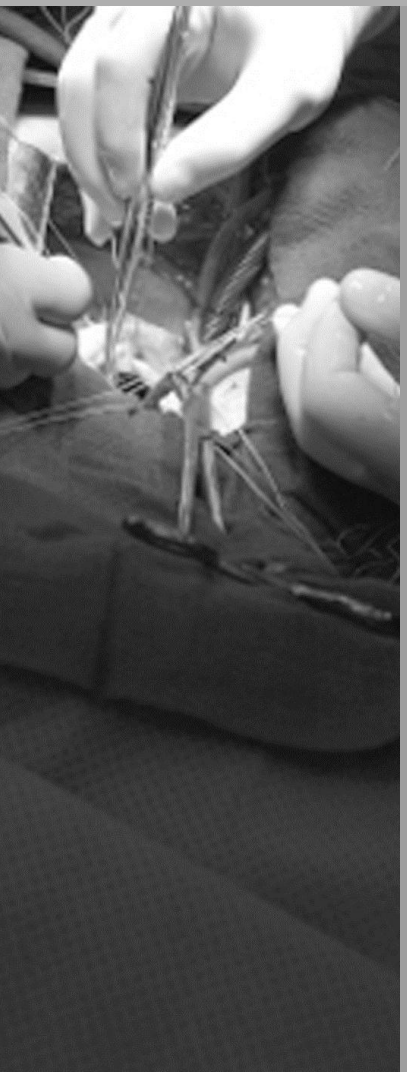
- Skin incision over the lowest rib overlying the empyema space
- 1.5cm portion of rib excised
- Pleura breached - histo obtained
- Space entered - debridement
- Dependant drain placed

CHEST WALL FENESTRATION (Eloessor flap)



- U-shaped skin incision
- short fragment 2+-3 ribs excised
- skin flap introduced into pleural space and sutured to parietal pleura

THORACOTOMY / DECORTICATION



- Most invasive procedure in management of ET
- Reserved for Stage III disease

Procedure

- GA
- - Single lung ventilation

Aim

- Fully evacuate the space
- Remove the fibrous rind
- Re-expand the lung

Restores the mechanical function of lung and improves vital capacity

IN CONCLUSION

Posttraumatic empyema remains a significant clinical problem
occuring in **2 - 10%** of victims of trauma
Factors leading to development of ET are mostly preventable
Primary feature is a retained haematoma
which needs to be evacuated,
either by ICD,
or by VATS,
within 5 days of trauma
Once an ET has developed the management is prolonged
with increased risk of morbidity and mortality.

THANK YOU FOR YOUR ATTENTION