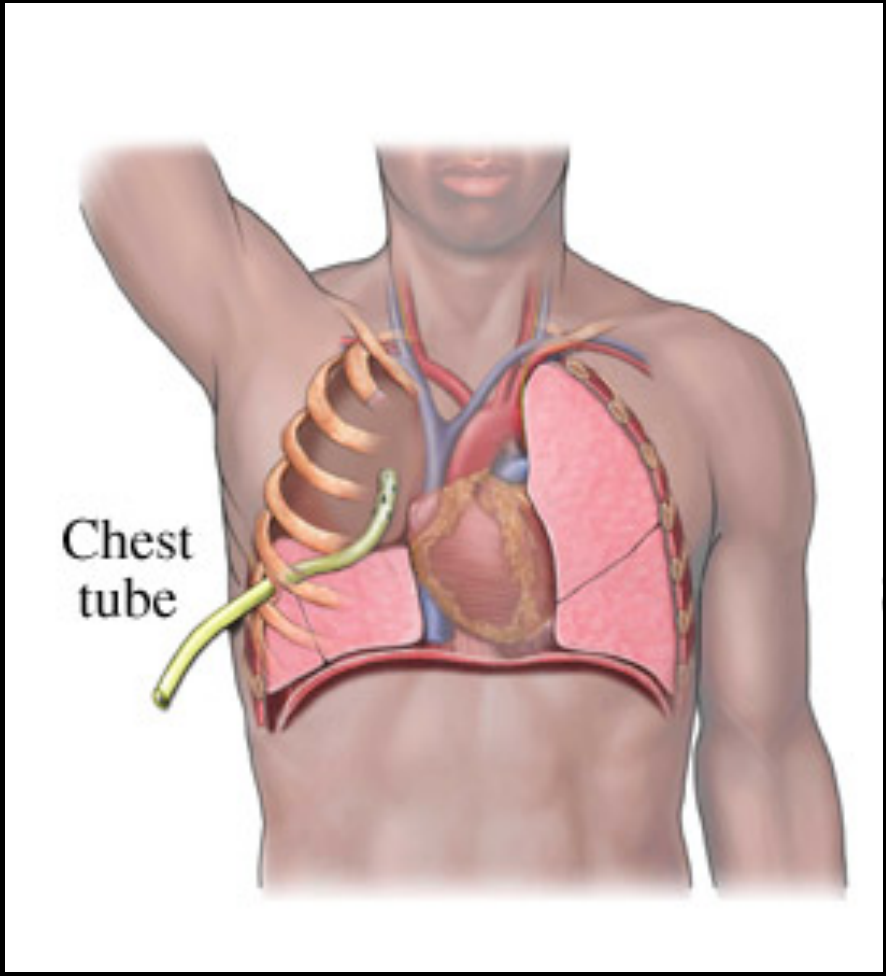
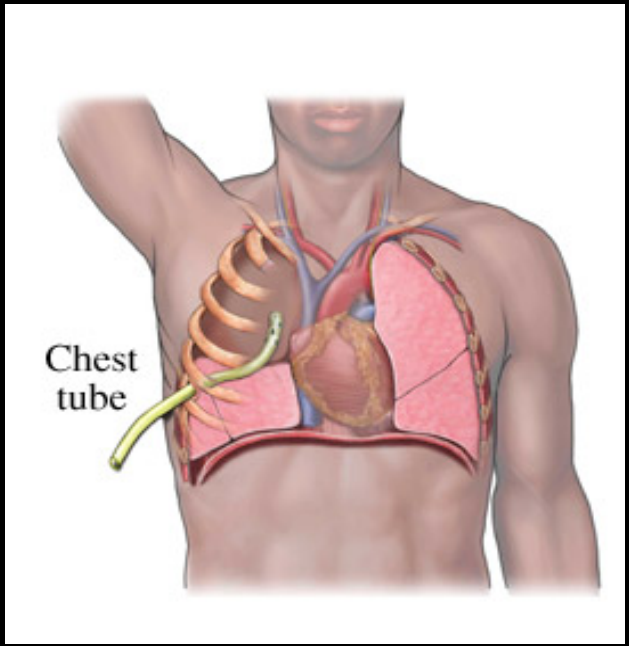
Chest Tubes

Chest Tubes



AKA…

- Inter-costal catheters (ICC)
- Inter-costal drains (ICD)
- Tube thoracostomy



Chest Tubes

Used for the drainage of FLUID (ie: air, blood, pus) thus allowing maximum re-expansion of the underlying lung.

Indications for insertion:

- Pneumothoraces
  - When known in ventilated patients who desaturate
  - Tension pneumothorax
  - After initial needle thoracostomy
  - Persistent pneumothorax after simple aspiration
  - Large spontaneous pneumothorax in patients > 50 years
- Malignant pleural effusion
- Infected collections
  - Empyema
  - Complicated parapneumonic pleural effusion

Indications for insertion:

- Chest trauma and …
  - haemo- and/or pneumo-thorax
  - before air transport
  - before lengthy ‘un-accompanied’ road transport
  - in hypotensive patient who arrests in A&E (bilateral)

- Post ‘open-chest’ operations:
  - thoracotomy
  - oesophagectomy
  - cardiac surgery

Chest tube pre-insertion procedure:

(important notes)

- Explain to patient what you are about to do.
- Make sure of the correct side for insertion
  - Auscultate patient's chest yourself!
  - Percuss patient's chest yourself!
  - Look at x-ray yourself!
- Prepare your procedure trolley in advance.
- Ask about allergies
  - Antibiotics
  - Latex
  - Lignocaine

Chest tube pre-insertion procedure:

(important notes)

- Remember that this a sterile technique when done unrushed.
  - Always where sterile gloves
  - Always give prophylactic antibiotics **beforehand**
    - Cefazolin 1.0g ivi
    - Augmentin 1.2g ivi

- Get yourself ready
  - Protective gown
  - Protective eye-wear

Steps to chest tube insertion

1. Position the patient

- Hand resting behind head and head turned to opposite side (if C-spine cleared)
- Arm outstretched to the side (like carrying an Olympic torch)
- Arm as far out abducted as possible and flexed at the elbow
  - Get someone to hold the arm.

2. Prepare the operative field

- Clean to sternum
  - May need to count ribs for position
- Clean into the axilla.
- Clean down to lower ribs.

- Place one sterile towel at the bottom of field.
  - Can rest instruments here later
  - Tube itself sits on this later
- Use fenestrated drapes if available
- Otherwise, use three more overlapping sterile towels

3. Chose a spot!

- On the correct side!

- In the mid- or anterior- axillary line
  - Behind pectoralis major to avoid having to dissect through this thick muscle.
  - Away from breast tissue

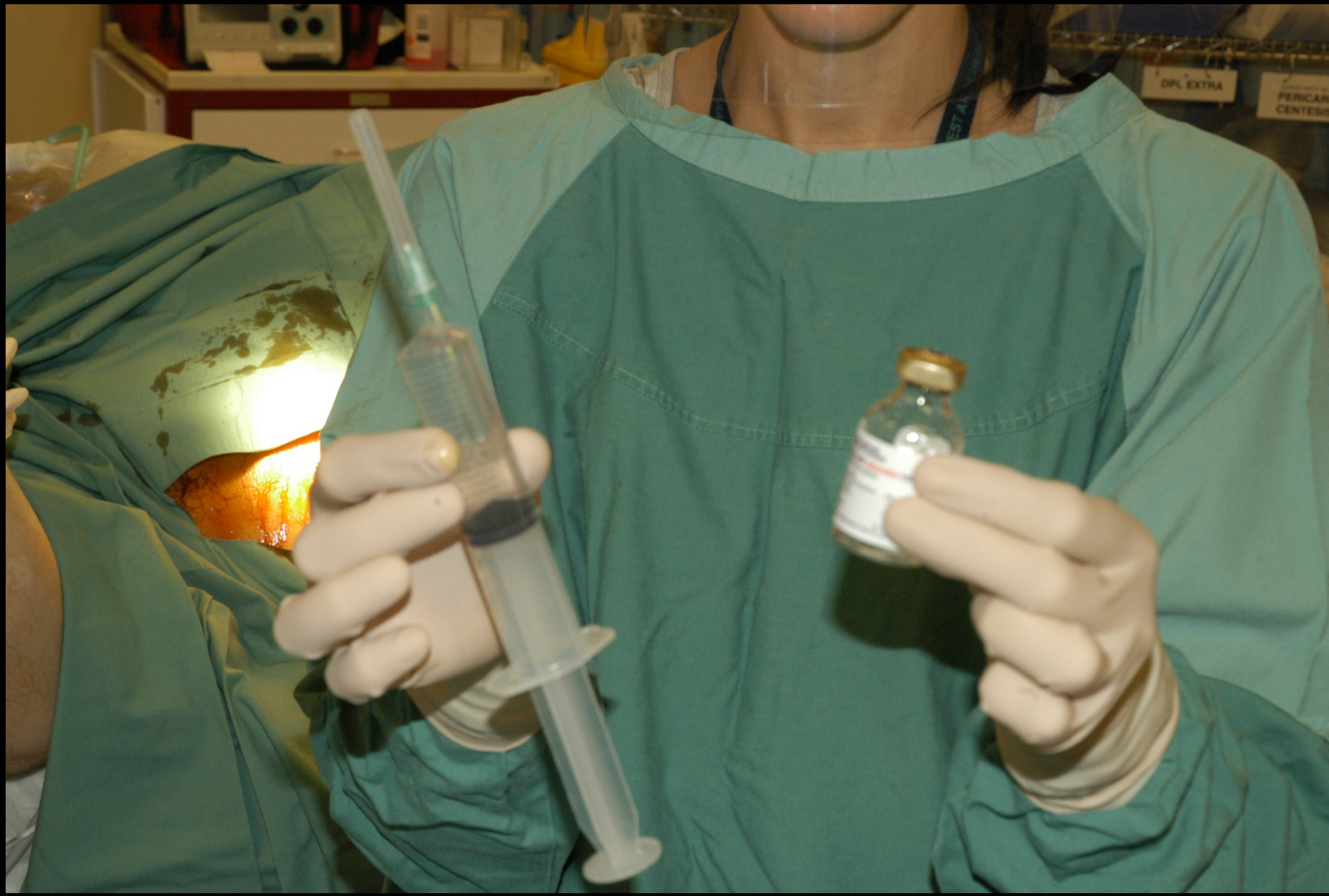
- In the 4th or 5^{th} intercostal space

The nipple line shifts, so do not rely on it!

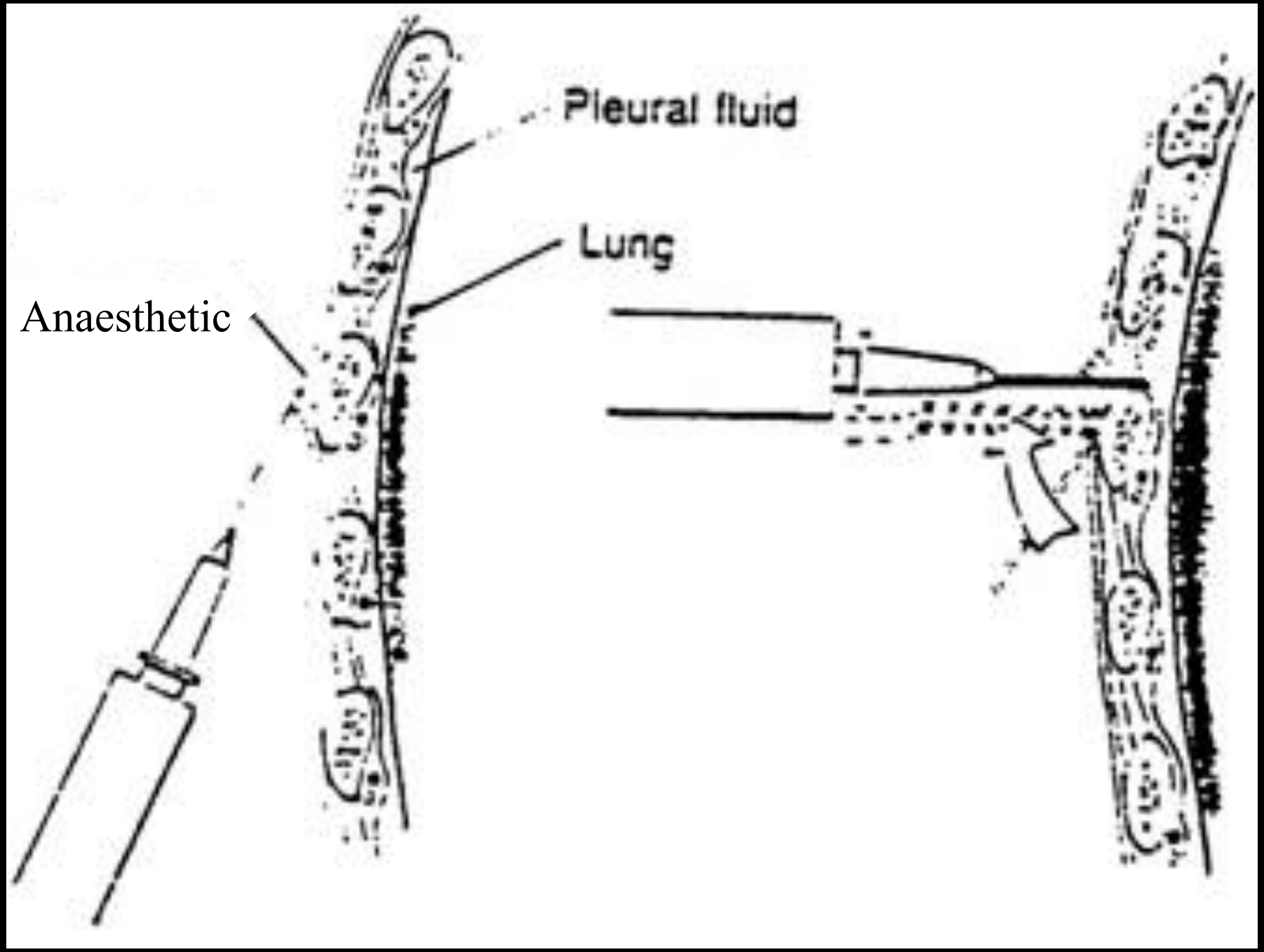
4. Anaesthetise the area

- Be generous with local anaesthetic
  - 20ml 1% lignocaine +/- adrenaline (ie 200mg)
  - remember the toxic dose of lignocaine is 3mg/kg without adrenaline added and 7mg/kg with adrenaline.

- Can also sedate patient: analgesia and amnestic agents (tailored to haemodynamics).


DPL EXTRA

- Block the painful parts
  - Skin (5 ml to for a wheal)
  - Pleura
    - Needle into pleural cavity (careful in small people)
    - Aspirate to see bubbles or fluid (blood, pus, etc..) while withdrawing slowly.
    - Another 5ml when fluid stops coming.
  - Intercostal muscles (5ml while slowly withdrawing needle)
  - Skin (5ml rib above and below insertion site)


Pleural fluid
Lung
Anaesthetic

5. Make a new skin incision

- Never insert a chest tube through an existing (ie: old) wound !
- Test the area first to ensure local working!
- Make a 3cm “up & down” incision
  - in SKIN ONLY!
  - over the rib below your chosen intercostal entry point

Never cut toward your hand.

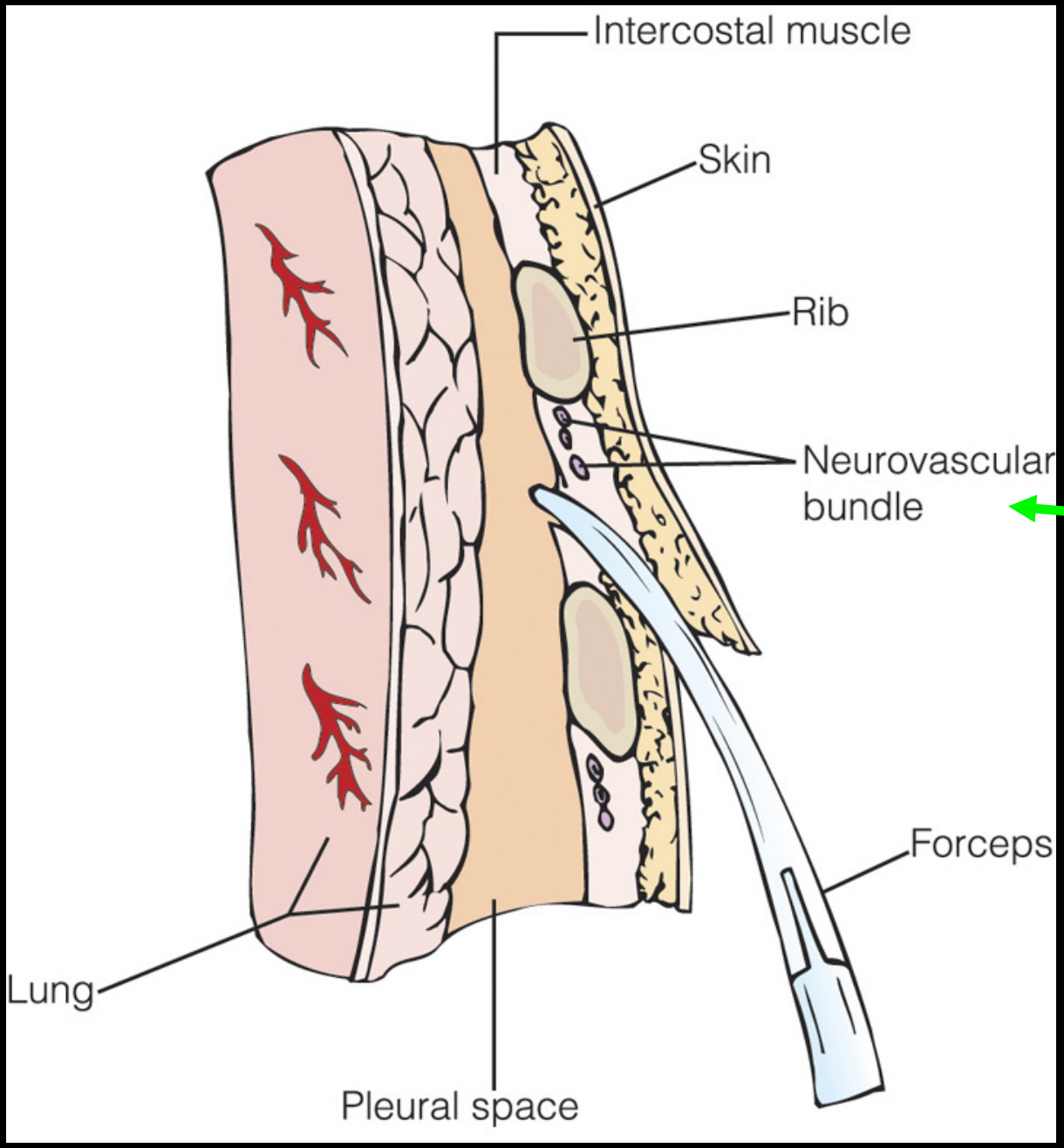
Hold wound at the top and cut downward.

6. Blunt dissection until in pleural space

- Short quick spreading movements to spread intercostal fibres away.
  - Like creating a tunnel through to the pleural space.

- Pierce the pleural membrane to release fluid.
  - Mind the gush of stuff!

- ‘Widen the tunnel’ with your large forceps.



Go over the rib to avoid NVB injury.

Remember in kids to go two ribs above skin incision!

7. ‘Look’ inside with your finger!

Feel for …

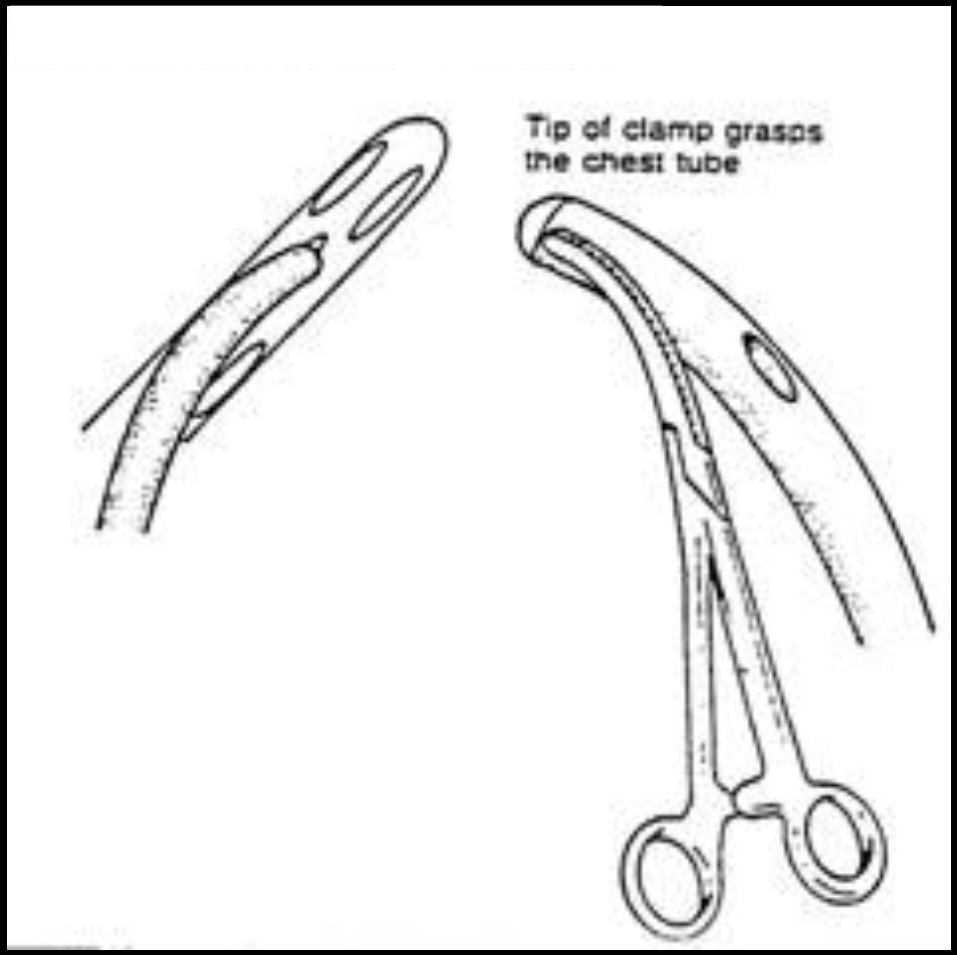
- Adhesions
  - Do a digital mini-decortication
- Lung parenchyma (crepitant and spongy)
- Bowel (oops!)
- Diaphragm rising to meet finger

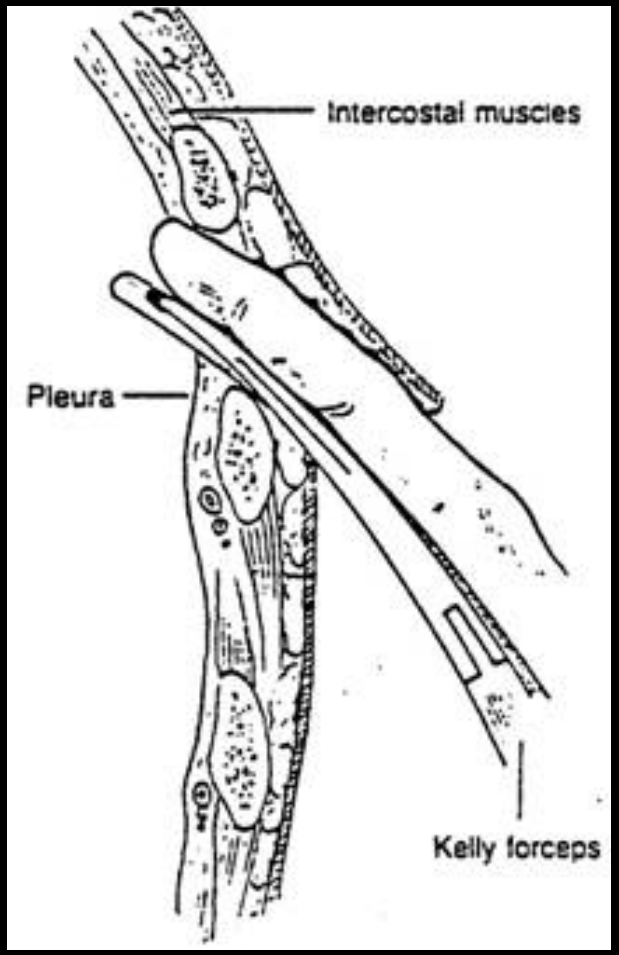
8. Now, put in the drain

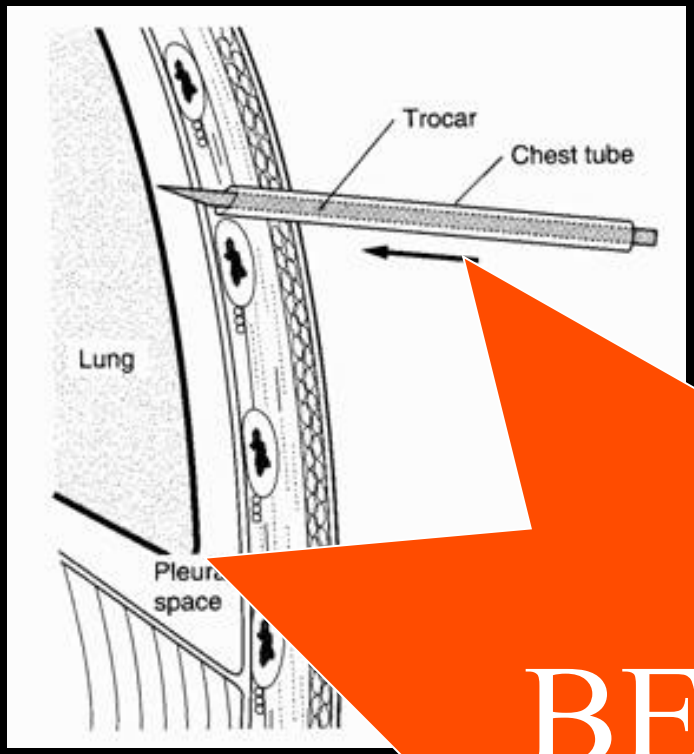
- Size 28Fr to 34Fr
- Put it the correct side in!
- Use your large forceps +/- your index finger to direct your path into the pleural cavity.
  - Be careful not to cut yourself on a broken rib!


Silicone

Open technique
(no pointed trocars!)



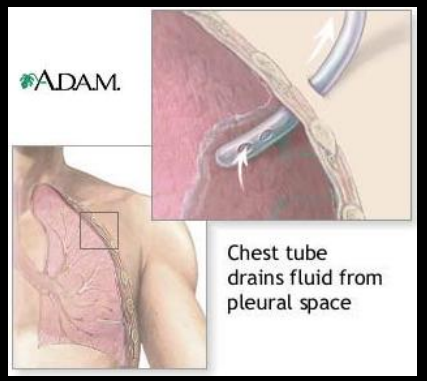




METAL TROCARS

BEWARE!!!

Tips…



- Not too far in.
  - Last hole at 10cm mark
- Aim posteriorly and superiorly
- Make sure drain not kinked.
  - Use your finger to check or unkink it…. or
  - Spin drain 360^{o} to un-do any possible kinks.

Drains at Liverpool Hospital


Cut just
at the tip

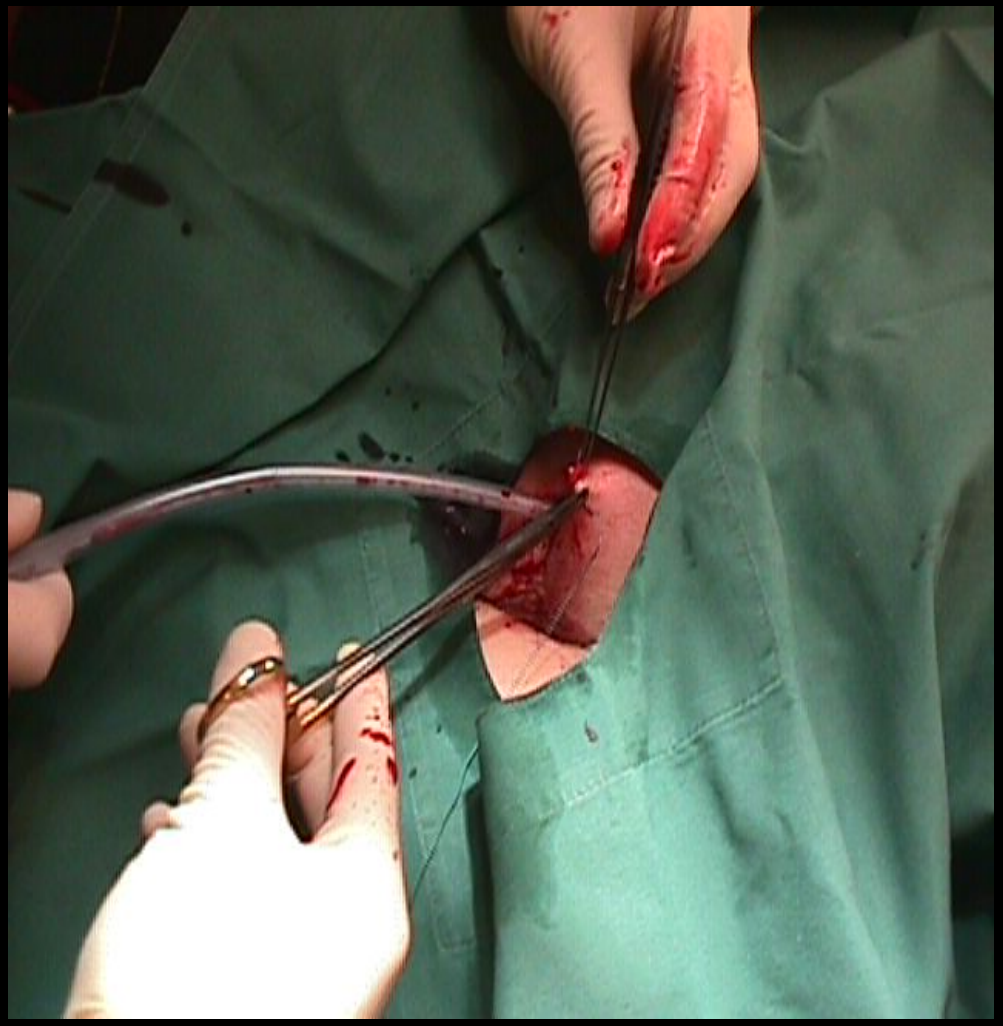
Clamp the tube or else you will have wet shoes!

9. Connect to bottle and secure drain

- Connecting to bottle
  - Have it prepared beforehand by nurse or by yourself.
  - Apply suction when indicated
  - Tell patient to cough to get out-flow going

- Securing drain
  - Think about removing it later!

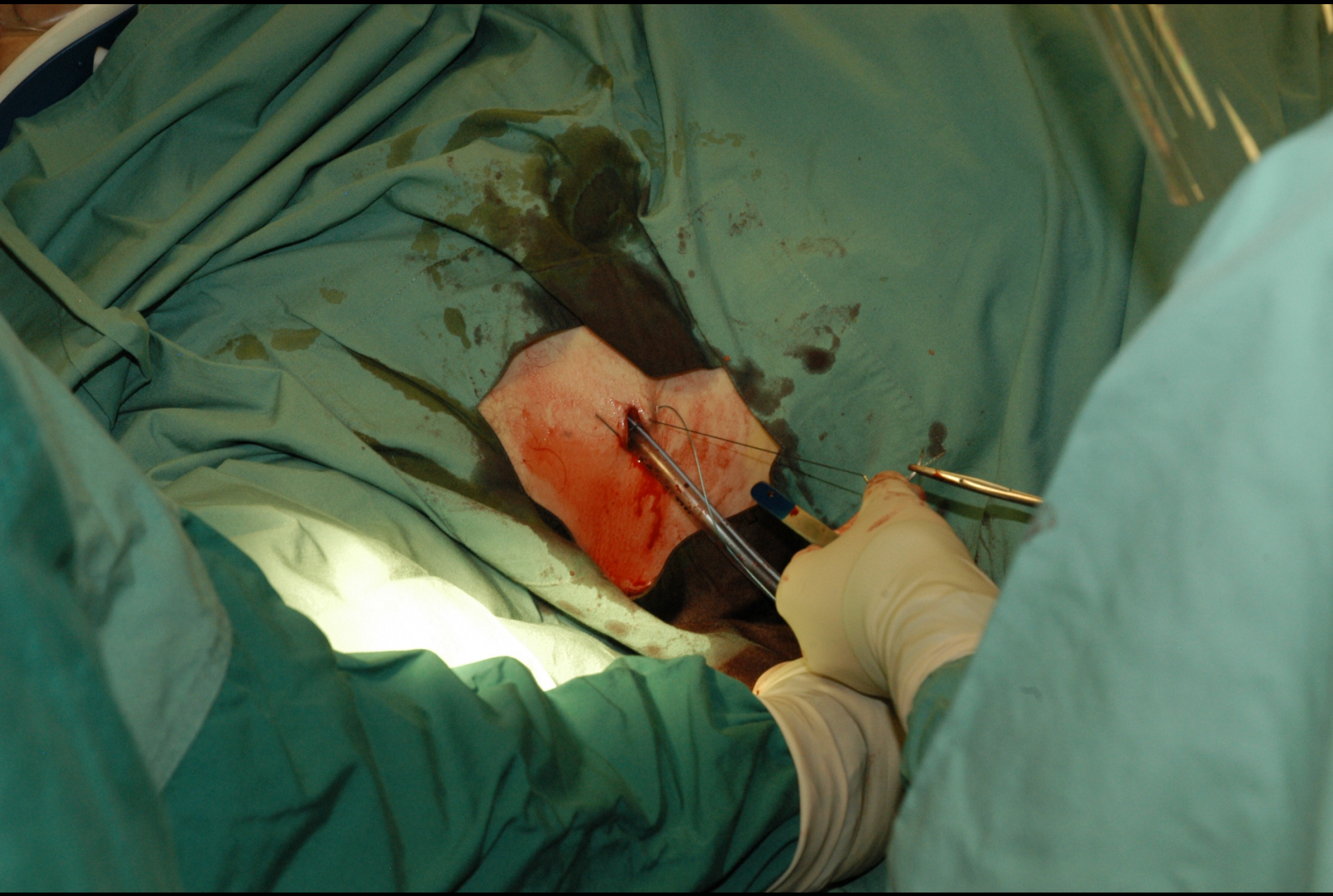
Securing the drain



- Thick suture
  - 0 or 1 Nylon, Ethibond or silk
- Appropriate stitch
  - Mattress
  - Purse-string
  - Z-stitch

Tricks to securing

- Place suture first in centre of skin incision.
- Leave little bit extra suture to close any gaps in skin incision.
- Careful not to prick hole in drain
  - Must be changed if done
- Give slight tug on drain at end to check if secure.




3/2010

10. Finishing touches!

- Dress drain-skin interface
- Tape drain with Elastoplast™ to lateral chest wall to prevent it being pulled out.
- Pad area where drain in contact with skin
- Clean up your mess!

Tube and patient points-of-care

- Tape all connections
- Pain control
- Check suction settings, if used
- Rehabilitative chest physiotherapy

Documentation

- Insertion date, time and person
- Site placed & drain size
- Output – colour & amount
- Bubbling or not?
- Vitals monitor

"Writing operative notes is like using the toilet….
You're never finished until the paperwork is done!"

Get a check chest x-ray afterwards!

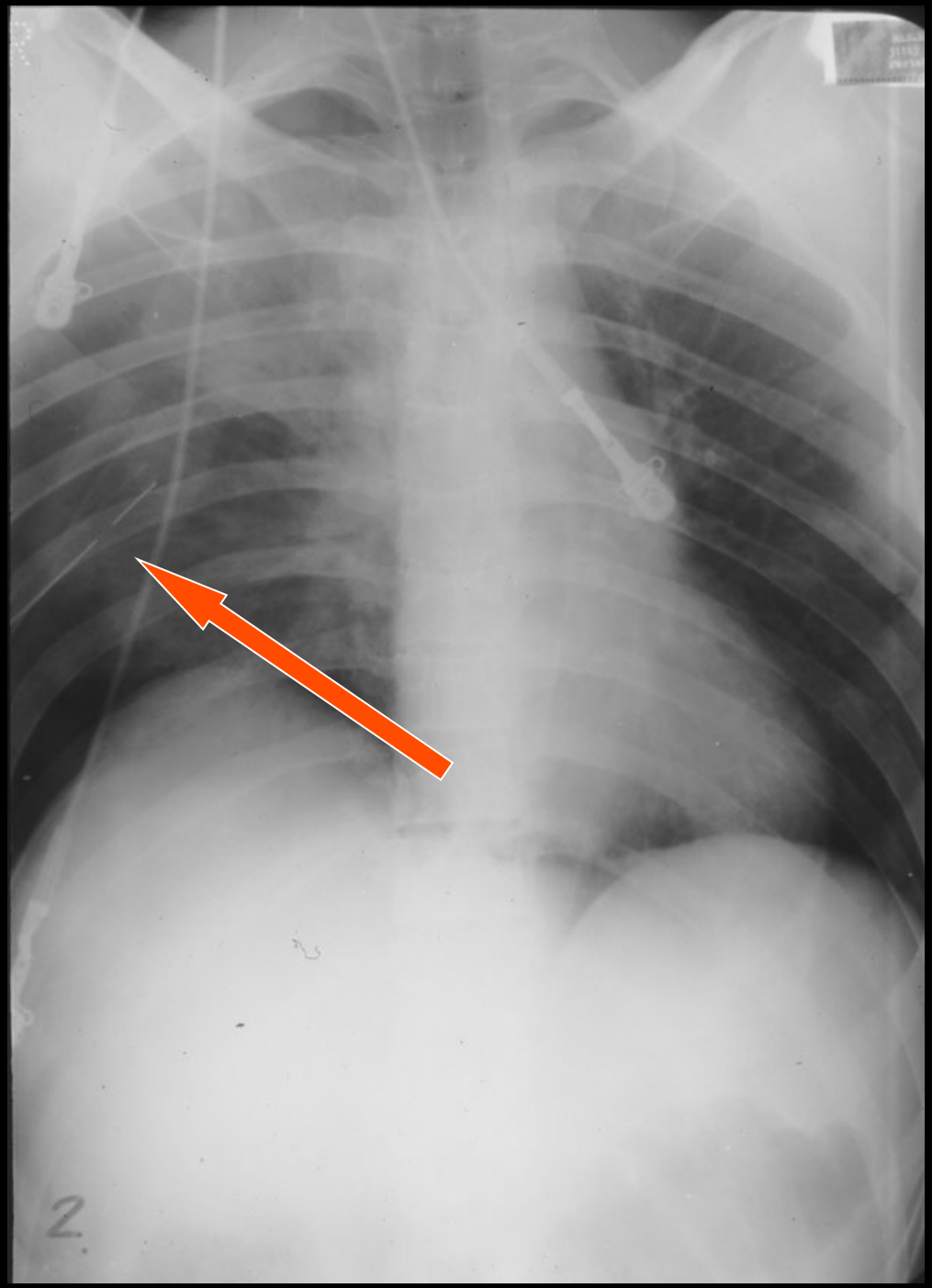
- Lung expansion
- Adequate drainage of fluid
- Placement of chest drain

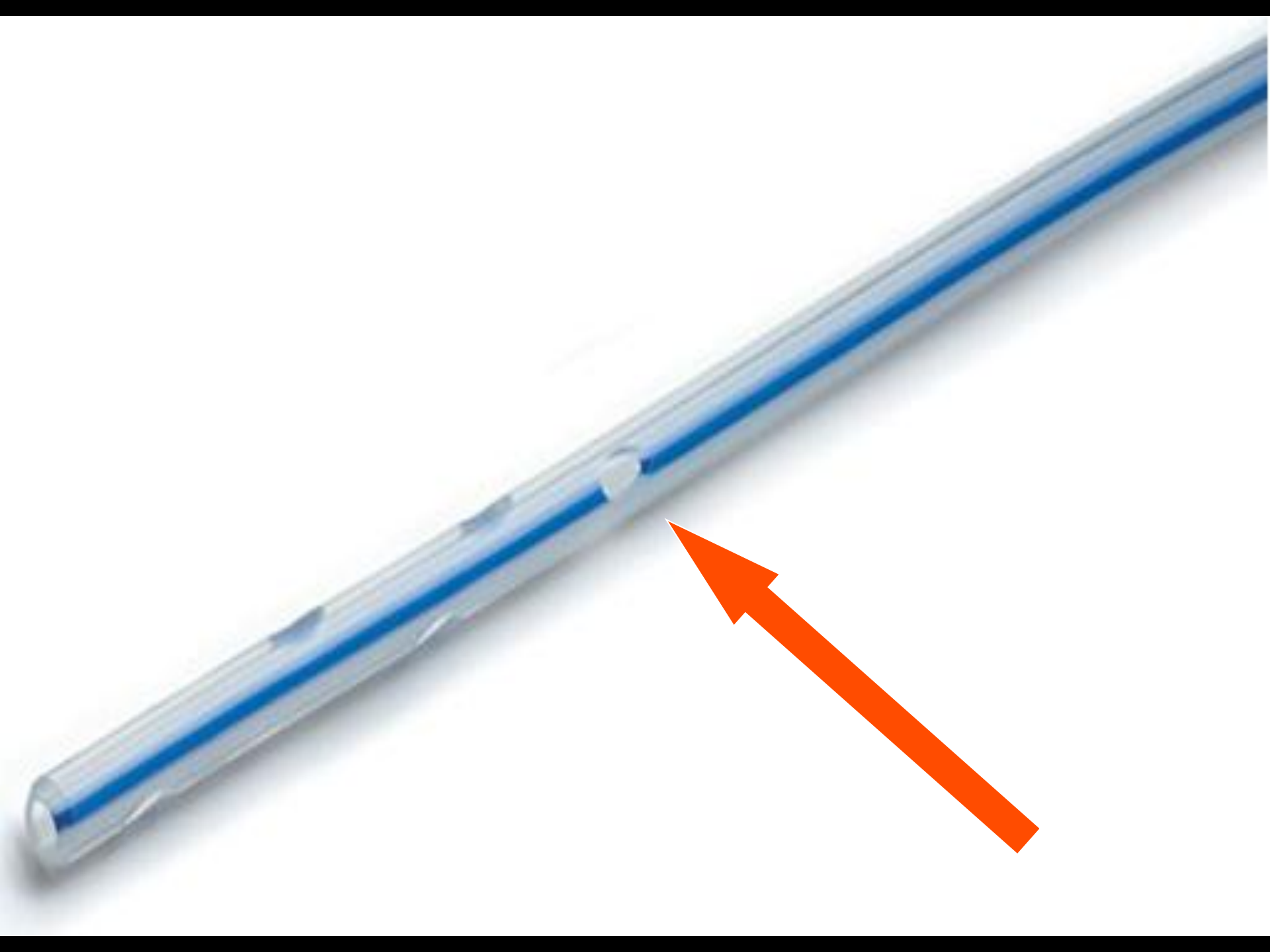
?

?

?

?


2

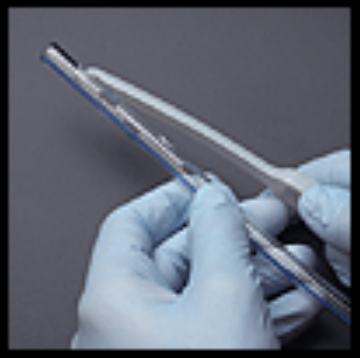


Patient education

- Deep breathing exercises
  - Incentive spirometer
  - After deep breaths, blow up latex glove
  - After deep breaths, blow bubbles in bottle.
- Incline or upright position in bed.
- Mobilisation and exercise

“Modern developments”

- Flexible introducer / trocar
- Pollard intercostal forceps
- Endoscopic insertion



PleuraGuide ™

When can a chest tube be removed?

"When it is no longer needed!"

- On examination
  - No longer bubbling
  - No longer swinging (ie: it is blocked!)
  - Serosanguinous fluid production < 100 ml / 24 hrs
  - Pus < 50 ml / 24 hrs and fistulous tract has formed

    (check Respiratory Unit here for their guidelines!)
  - No clinical air leak
  - For a simple pneumothorax → within 24 hours

- On x-ray
  - No significant pneumothorax (ie > 10%)
  - Lung fully expanded
  - No residual haemothorax

→ Clamping of chest tube can lead to dangerous situations !

How to remove a chest tube?

- Valsalva Manouvre:
  - remove at height of or during sustained exspiration
- Seal entry site immediately with gauze / tape / previous applied suture
  - A two-person procedure!
- X-ray after 1 hour (check local policy) or on clinical indication.

BEST to remove a
chest tube
in the morning !

Pitfalls :

- Avoid clamping drain
  - Can lead to tension pneumothorax
  - Do so only when changing bottle
- Avoid raising drain above the level of the chest
  - contents can siphon back into chest
- If disconnection then reconnection occurs, ask patient to cough.

More pitfalls :

- Persistent air leak: consider low pressure suction.
- Observe for post-expansion pulmonary oedema

Complications:

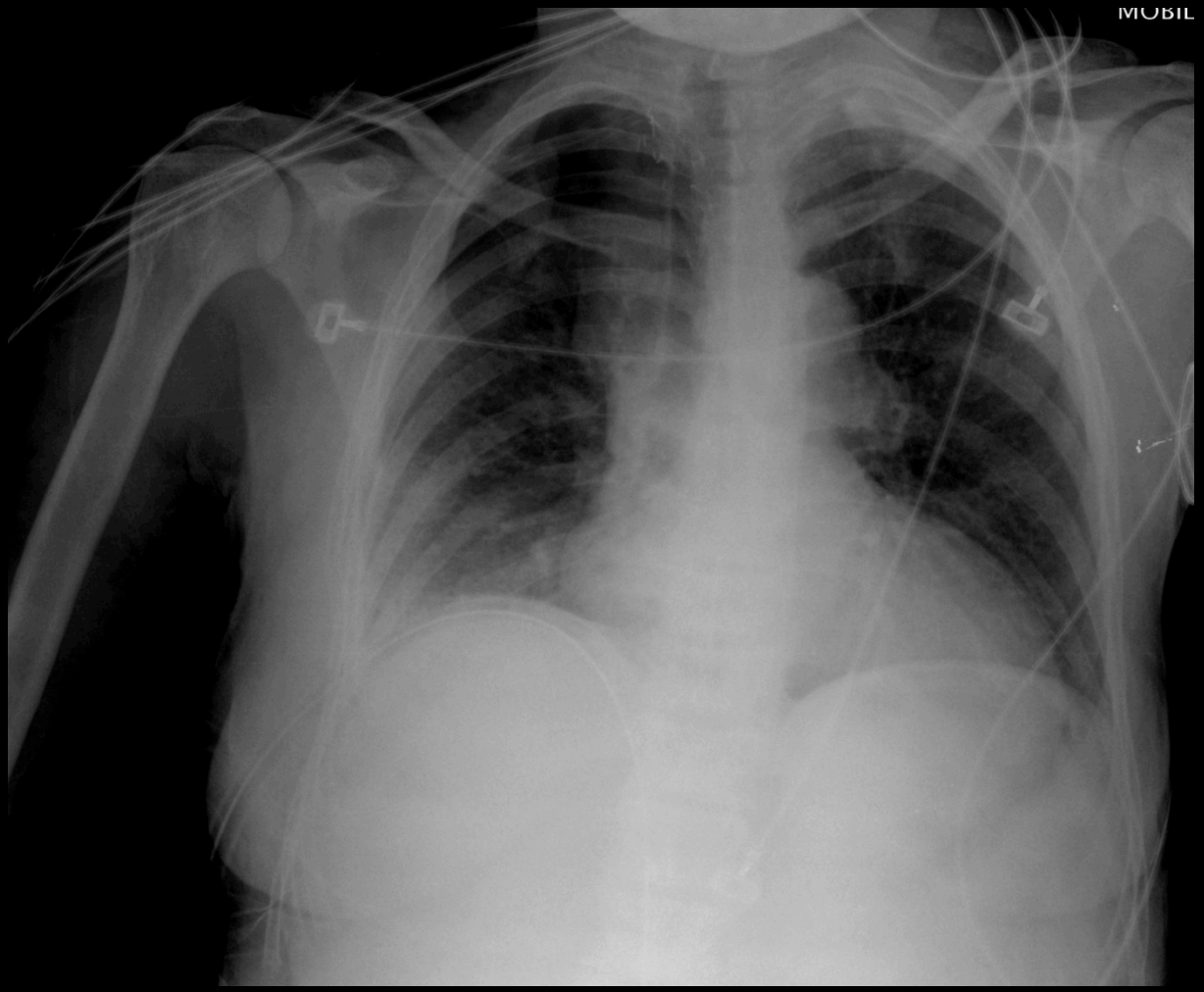
"There is c[illegible]n of insertion of a chest drai[illegible]d by the chest drain i[illegible]

WRONG!!!!!

Complications:

"There is no organ in the thoracic or abdominal cavity that has not been pierced by a chest drain."

Complications:



Complications:

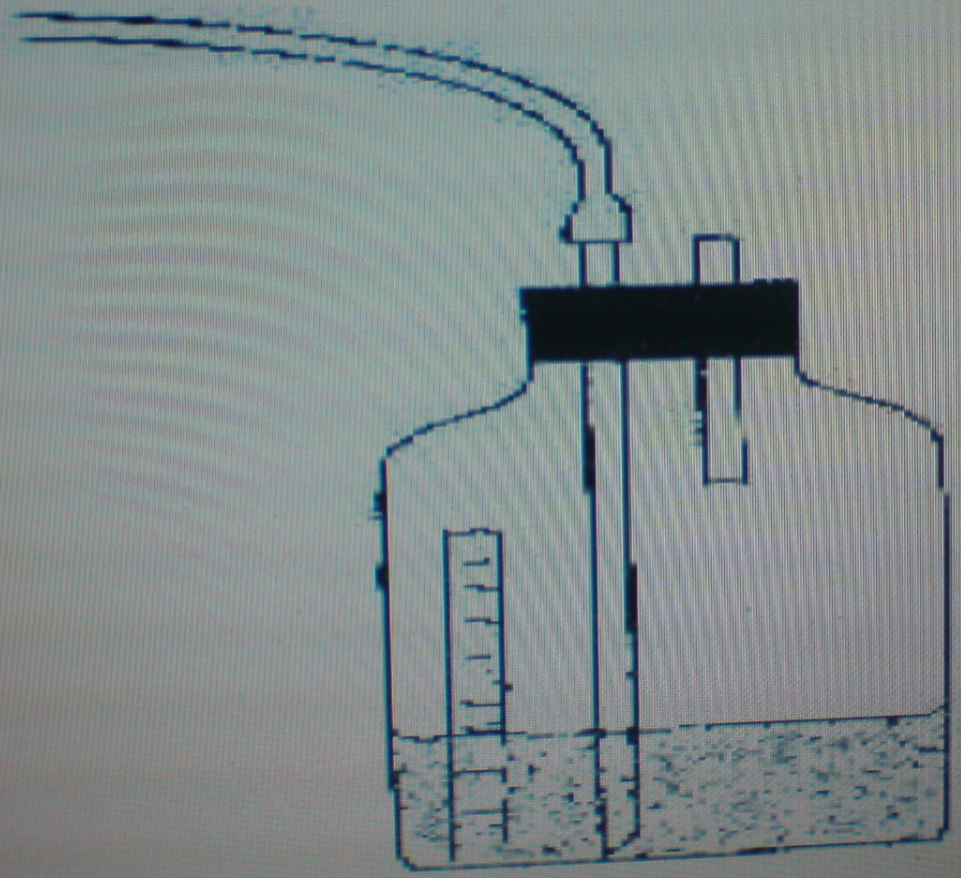
- Early complications (3%)
  - Haemothorax
  - Lung laceration
  - Diaphragm and abdominal cavity penetration
  - Bowel injury in the presence of unrecognised diaphragmatic hernia
  - Tube placed subcutaneously
  - Tube inserted too far
  - Tube inserted incorrectly too low
  - Tube displaced

Complications:

- Late complications (8%)
  - Blocked drain
  - Retained haemothorax
  - Empyema
  - Pneumothorax after removal

Chest drain systems

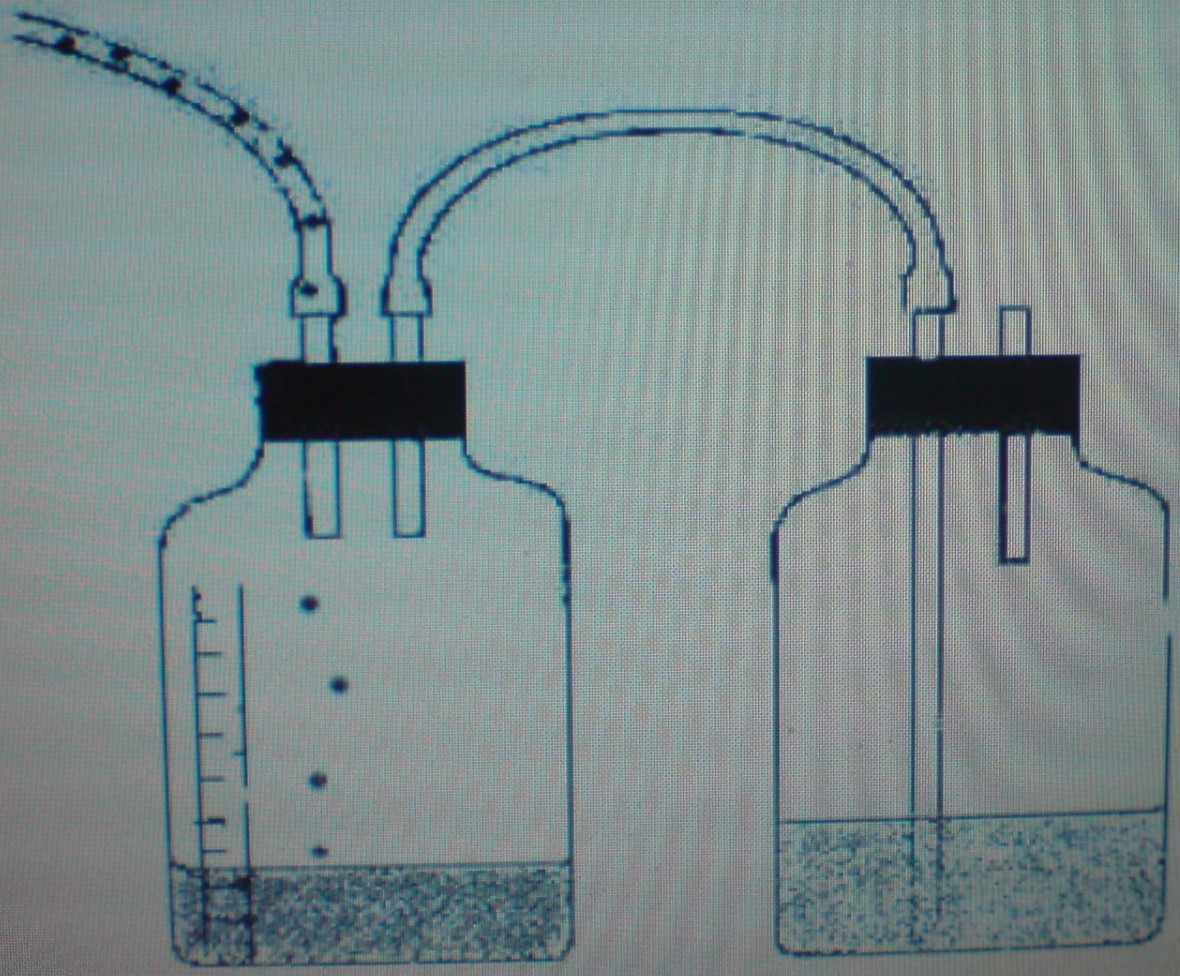
One-Bottle System



One-bottle system

- Simplest closed drain system
- Needs to have vent to release pressure
- For drainage by gravity
- Generally for pneumothorax

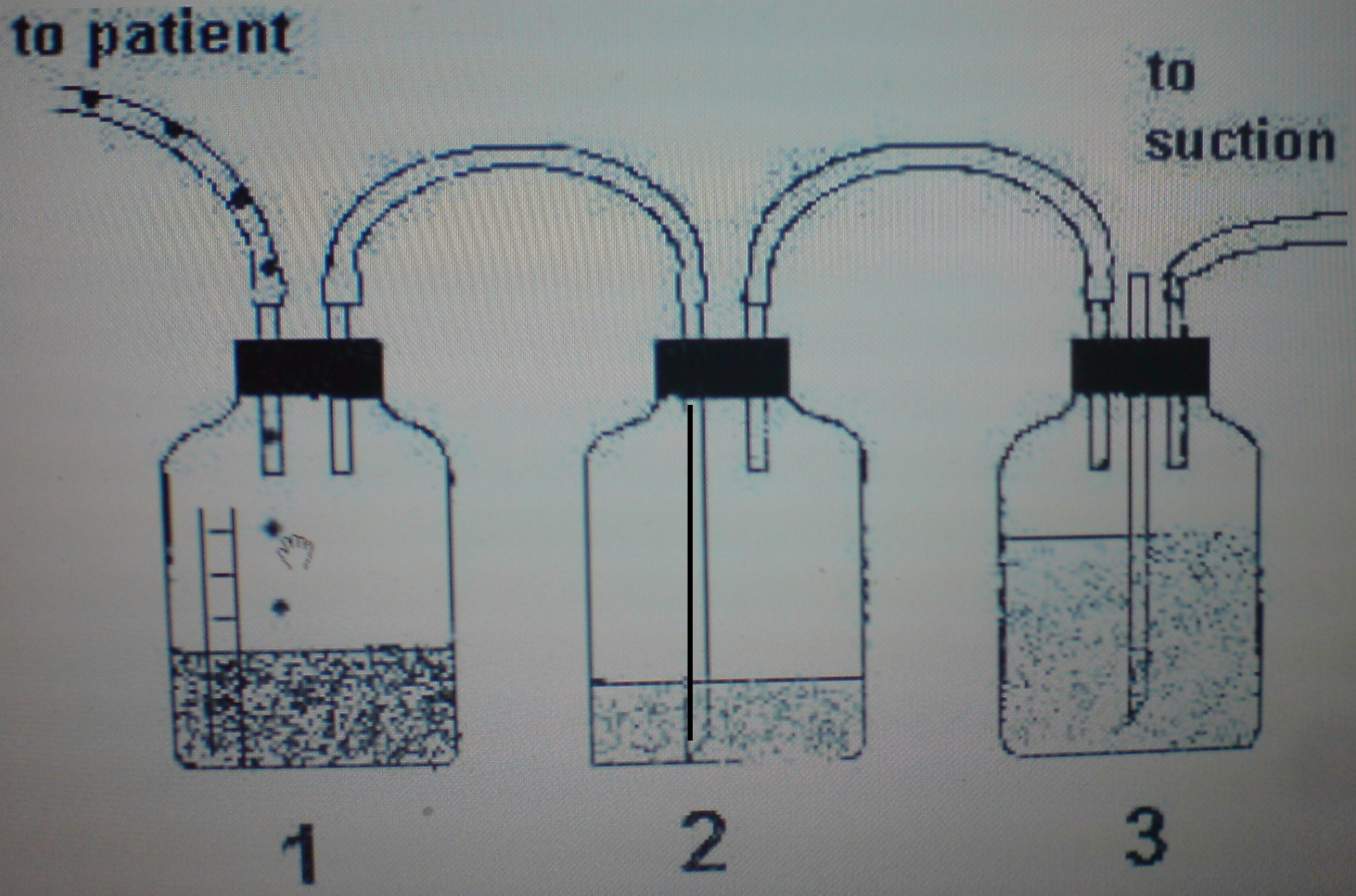
Two-Bottle System



2-bottle system

- 1st bottle for drainage
- 2nd bottle for under water seal
- Water seal stays at fixed level

Three-Bottle System



3-bottle system

- Drainage bottle
- Water seal
- Suction control
- Suction controlled by manometer
  - 3-in-1 system

Summary

- The "9 S's" of successful and safe insertion:
  - Sedation
  - Sterility
  - Site
  - Sensitive – finger dissection
  - Suturing
  - Suction (about 20 cm H_20)
  - Side effects – usually related to poor technique
  - Seal carefully – on removal of tube
  - Sessions – practice in elective cardiothoracics operating list

References:

- http://www.drugs.com/enc/image_pages/9968.html (accessed 2nd May, 2010).

- D'Amours et al. *Handbook of Trauma Care: The Liverpool Hospital Trauma Manual*, 6th Ed. Pg: 151-153.

- "Chest drain insertion". http://www.trauma.org/index.php/main/article/400/ (accessed 3rd May, 2010).