



Stepwise assessment of Chest Tube Function

TUBE POSITIONING

Look at the CXR: is the chest tube correctly positioned to drain air/fluid? Are **all six** of the side holes within the chest cavity? Has it moved since a prior CXR?

- If a chest tube is mal-positioned it may need to be removed/replaced.

CHEST TUBE OUTPUT

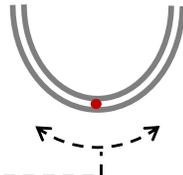
How much fluid output has there been in the last 24 hours? Check the **DRAINAGE** area of the chest drain.

- Generally, it is reasonable to remove a chest tube if the **output is <200 ml/day**.
- If a tube stops draining, **fibrinolytics can be used** to clear obstructions.

TIDALING (RESPIRATORY VARIATION)

Tidaling indicates that the chest drain is within the pleura and transducing the pleural pressures. Look for **movement of the indicator ball** in the chest drain. Also look for **cyclic movement of fluid** in dependent loops of tubing.

- You can temporarily disconnect suction (bend the suction tubing to occlude it) to make it easier to evaluate tidaling.

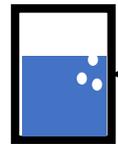


AIR LEAK

Air leak is the presence of bubbles in the **WATER SEAL** chamber indicating that air is present within the chest (or a leak is present in the drainage system).

Intermittent air leak occurring with the respiratory cycle (typically at end inspiration) indicates an injury to the lung or airways. Have the patient cough to see if air leak occurs with higher pressures.

Continuous air leak – throughout the respiratory cycle suggests either a large injury to lung or airways or a leak in the tubing.

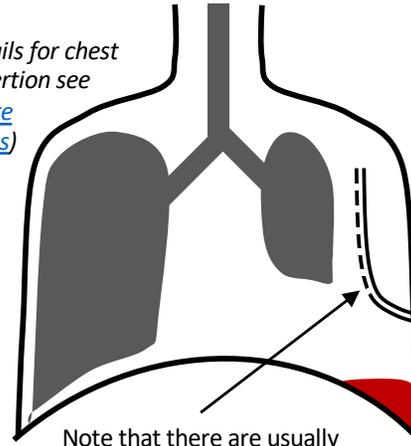


SUCTION

Is the drain connected to suction? How much **suction** is applied? Be cautious about applying suction to large effusions as rapid drainage can **precipitate re-expansion pulmonary edema**.



(For details for chest tube insertion see [Procedure Checklists](#))



Note that there are usually **6 side holes** on chest tubes.

CHEST TUBE SIZING & POSITIONING

Tubes sized by internal diameter (1 Fr = 0.3 mm). Recommended size varies by indication:

- 14-22 Fr stable pneumothorax
- 24-28 Fr tension pneumothorax
- 28-32 Fr hemothorax/empyema
- Smaller pigtail drains placed by Seldinger technique may have equivalent outcomes.

Ideal direction where tube is placed:

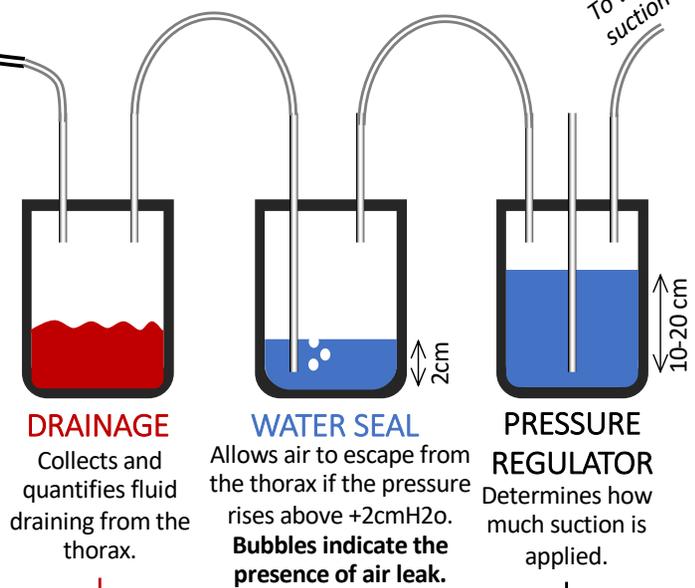
- For air → anterior superiorly
- For fluid → posterior inferior

WEANING A CHEST TUBE

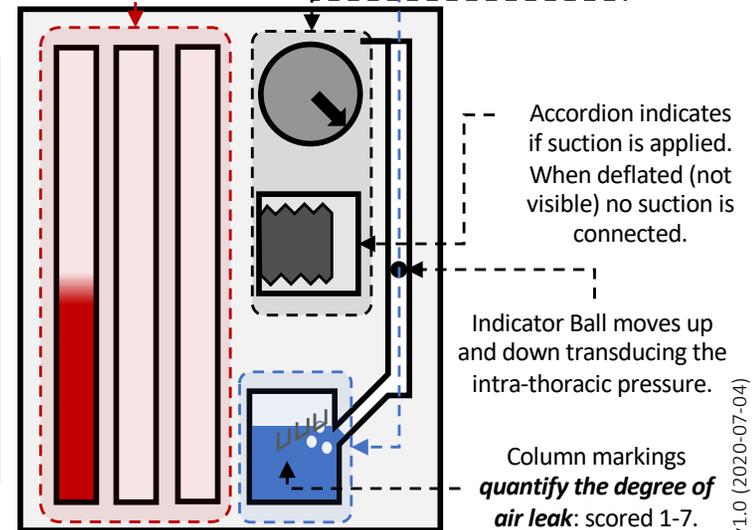
- Generally, chest tubes are initially placed on suction. This facilitates air/fluid removal from the thorax.
- Upon resolution of the pneumothorax or drainage of an effusion, suction can be discontinued (this is called "**being on water seal**")
- Clamping** a chest tube simulates removal. Though **usually unnecessary**, this is done prior to removal to ensure a pneumothorax does not recur. This can be useful if considering removing a chest tube while on positive pressure ventilation.

Underwater chest drain system combines **DRAINAGE**, a one-way valve (**WATER SEAL**), and allows a precise amount of negative pressure to be applied (**PRESSURE REGULATOR**). Modern systems provide the same functions.

The old **three bottle system** illustrates the functionality:



A modern chest drain looks different but has the same functions:



Accordion indicates if suction is applied. When deflated (not visible) no suction is connected.

Indicator Ball moves up and down transducing the intra-thoracic pressure.

Column markings quantify the degree of air leak: scored 1-7.