

TUBE THORACOSTOMY (CHEST TUBE)

INDICATIONS (DAVID KESSLER, M.D., 7/2013)

Indication for tube thoracostomy include: pneumothorax, hemothorax and pleural effusion (empyema, chylothorax). Alternatives to chest tube placement may be considered in: patients who are asymptomatic, have small collections or have no need for positive pressure ventilation.

ALTERNATIVE TECHNIQUES
Observation only: absorption of pneumothorax increased with inspired oxygen
Pleurocentesis (catheter aspiration): fluid or air
Modified Seldinger technique with pigtail catheter or Heimlich valve; air
Chest tube placement with trocar (higher risk of injury) or over a bougie
Operative thoracotomy, video assisted thorascopic surgery (VATS): complex collections

CONTRAINDICATIONS

There are no absolute contraindications. Relative contraindications may include bleeding diathesis, pleural adhesions and complex or loculated collections

ANATOMIC LANDMARKS

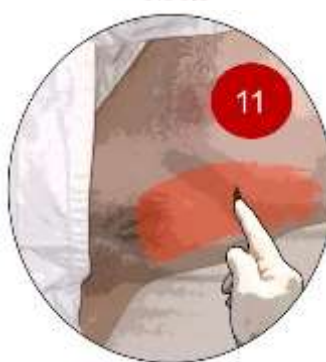
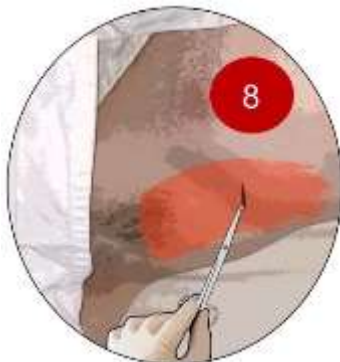
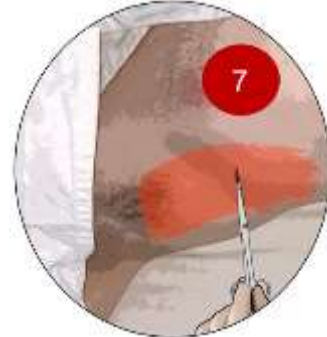
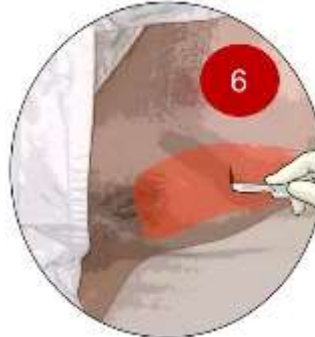
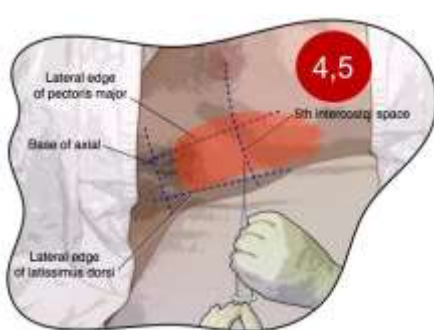
Emergency department chest tube placement is typically at the 4th/5th intercostal space in the mid-axillary line though other landmarks may be appropriate.

EQUIPMENT	CHEST TUBE SIZE (FRENCH)
Use universal precautions, drape, antiseptic	Neonate 12-18 F
1% Lidocaine with Epinephrine if awake	6 month 14-20 F
Scalpel	1-2 years 14-24 F
Large Kelly clamp	2-8 years 20-32 F
Small clamp (for clamping the distal end of tube)	8-10 years 28-38 F
Chest tube	Adolescent/Adult 32-40 F
Silk suture with straight needle, scissors	In general, smaller tubes are required for air than are required for fluid
Vaseline Gauze, regular gauze, tape	
Pleural drainage system	

PROCEDURE: SELDINGER TECHNIQUE	
1	Identify anatomic landmarks, prepare, anesthetize area
2	Make a small incision over desired intercostal space, above rib
3	Insert the needle into the pleural space, aspirate air/fluid
4	Insert guide wire through introducer needle and into the pleural space
5	Guide the wire apically (air) or inferior/posterior (fluid)
6	Pass the dilator(s) over the wire - Don't lose wire in pleura cavity!
7	Remove the dilator and pass chest tube into pleural space
8	Remove guide wire
9	Connect chest tube to pleural drainage system

PROCEDURE: STANDARD TECHNIQUE

1	Cardiac monitor, consider procedural sedation
2	Use universal precautions, gown, mask, gloves. Use sterile technique
3	Have patient place their arm over their head to expose the lateral chest wall
4	Locate the 4 th /5 th intercostal space in the mid-clavicular line
5	Inject Lidocaine over lower rib, then through muscle and into the pleura
6	Make a 2-3 cm incision over lower rib, down to bone. (Some recommend making the incision in the intercostal space below and tunneling up to the desired intercostal space to avoid air leaks)
7	Blunt dissect superiorly with Kelly clamp toward the intercostal space
8	With the clamp in closed position, push clamp through pleura over the inferior rib to avoid injury to the neurovascular bundle that parallels the lower rib margin.
9	This may require considerable force. Hold the Kelly clamp close to the distal end to avoid inserting the clamp further than necessary into the pleural space
10	Open the Kelly clamp in the plane parallel to the ribs to further open pleura wide enough to allow chest tube passage
11	Insert a finger into the pleural space to confirm proper position
12	Clamp the distal end of chest tube with a small clamp
13	Clamp the Kelly clamp over the proximal end of the chest tube
14	With aid of Kelly and finger, guide chest tube: <ul style="list-style-type: none"> a. Apically, medially and anteriorly for air b. Apically, medially and posteriorly for fluid
15	Advance the tube sufficiently to ensure that the holes are within pleural cavity
16	Connect to pleural drainage system
17	Suture to skin, apply Vaseline gauze, dressing
18	Obtain a chest XRAY and look for condensation to confirm correct placement



COMPLICATIONS	
Hemodynamic instability	Evacuation of a large hemothorax may result in hemodynamic instability if the hemothorax served to tamponade further bleeding into the pleural space. Administer blood components prior to the evacuation of massive hemothorax
Mal-positioning of the tube	25% of chest tubes are malpositioned (intrafissural, intraparenchymal, or subcutaneous). The majority of these malpositions may not be diagnosed by CXR and may only be identified by CT
Re-expansion pulmonary edema	Patients with a large pneumothorax/pleural effusion and those who have a pneumothorax for a few days are at risk for re-expansion pulmonary edema (RPE). This risk does not appear to be reduced by attempts at limiting re-expansion. The hallmark is cough with frothy sputum. A chest XRAY may reveal near total opacification on the affected side. Treatment is supportive with oxygen and assisted ventilation (non-invasive or mechanical) as required.
Tension pneumothorax	A tension pneumothorax may occur if there is a persistent air leak from the lung and the chest tube is occluded or misplaced. Correction of occlusion, correcting the location of a misplaced tube or needle thoracentesis may be indicated