NEEDLE THORACENTESIS

Pneumothorax / Hemothorax

By: Steven Jones, NREMT-P
Pneumothorax is a collection of air or gas in the pleural space of the lung, causing the lung to collapse. Pneumothorax may be the result of an open chest wound that permits the entrance of air, the rupture of an emphysematous vesicle on the surface of the lung, a severe bout of coughing, or it may occur spontaneously without evident cause.
Pneumothorax

Three Major Types of Pneumothorax

- Open Pneumothorax
- Closed Pneumothorax
- Spontaneous Pneumothorax
Open Pneumothorax

- Open pneumothorax
  - results when a penetrating chest wound enables air to rush in and cause the lungs to collapse.
Open Pneumothorax
Closed Pneumothorax

• Closed pneumothorax
  – results when the chest wall is punctured or air leaks from a ruptured bronchus (or a perforated esophagus) and eventually ruptures into the pleural space.
Closed Pneumothorax
Spontaneous Pneumothorax

- Spontaneous Pneumothorax
  - occurs in a previously healthy individual with no prior trauma. This is thought to be due to rupture of a bleb (a blister containing air) on the surface of the lung. This spontaneous pneumothorax is most frequent in people under the age of 40.
Spontaneous Pneumothorax

<table>
<thead>
<tr>
<th>Onset</th>
<th>Sudden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other history items</td>
<td>- History of prior pneumothoraces</td>
</tr>
<tr>
<td></td>
<td>- May experience pleuritic chest pain</td>
</tr>
<tr>
<td>Physical exam</td>
<td>Diminished or absent lung sounds findings unilaterally</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>May occur more frequently with patients who have a thin body habitus and those with chronic lung conditions.</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Medications generally include inhaled beta agonists (albuterol) or cholinergics (Atrovent). May also</td>
</tr>
</tbody>
</table>
Hemothorax

Hemothorax is an accumulation of blood and fluid in the pleural cavity, between the parietal and visceral pleura, usually the result of trauma. Blood can also accumulate in the thorax cavity as a result of erosion of pulmonary vessels, the rupture of blebs, or granulomas. Hemothorax also may be caused by the rupture of small blood vessels that results from inflammation caused by pneumonia, tuberculosis, or tumors.
Hemothorax

Blood in pleural space
Hemopneumothorax

Hemopneumothorax is a collection of blood and air in the pleural cavity. A hemothorax (or haemopneumothorax) is best described as a combination of the two previously discussed conditions, Pneumothorax and Hemothorax.
Pulmonary Barotrauma occurs when a patient whose lung function is being maintained mechanically (or by BVM) may have air forced into the lungs beyond pleural capacity, which may rupture the pleural space.
Tension Pneumothorax

Tension Pneumothorax is a life threatening condition that can occur due to the progression of a pneumothorax or hemothorax. As air, blood or both build in the pleural cavity, the vital structures and organs in the thoracic cavity can be shifted to the unaffected side. As the condition progresses this shift can cause the collapse of the unaffected lung.
Tension Pneumothorax
Signs / Symptoms (early)

- Obvious Trauma (Sucking Chest Wound)
  - For Open Pneumothorax
- Chest Pain
- Severe Respiratory Distress
- Tachycardia / Tachypnea
- Hypotension
- Decreased or Absent Breaths Sounds on the affected side
Signs / Symptoms (late)

- Cyanosis
- Distended Neck Veins (JVD)
- Tracheal Deviation (away from the affected side)
- Respiratory Failure
- Asystole
Field Treatment

Field treatment for a Tension Pneumothorax or Tension Hemopneumothorax is:

NEEDLE THORACENTESIS

It is important to understand that not every pneumothorax is a tension pneumothorax. Tension Pneumothorax is determined through patient assessment based upon the presenting signs, symptoms, and history.
Needle Thoracentesis

Needle Thoracentesis is the introduction of a needle or catheter into the pleural space to release trapped or accumulated air within the pleural space. Needle Thoracentesis is used to decompress the pleural cavity and allow the collapsed lung to re-inflate and also to reduce the pressure on the heart and unaffected lung usually associated with a tension pneumothorax. A Needle Thoracentesis is to be performed on rapidly deteriorating patients who have developed a tension pneumothorax. (If this technique is used and the patient does not have a tension pneumothorax, there is a 10% to 20% risk of producing a pneumothorax and or causing damage to the lung.)
Needle Thoracentesis

Needle thoracocentesis
Emergency decompression of clinical tension pneumothorax
Needle Thoracentesis
Indications

• Tension Pneumothorax
• Tension Hemopneumothorax
Contraindications

Needle Thoracentesis (chest decompression) is indicated in the field only in the face of a life-threatening tension pneumothorax. In that situation, there are essentially no contraindications since the only alternative is almost certain death.
Causes

• Causes of Tension Pneumothorax or Hemopneumothorax include
  – Blunt force trauma to the chest that ruptures a portion of lung tissue
  – Fractured rib that punctures the lung tissue
  – Spontaneous pneumothorax for no apparent reason
  – Conversion of a simple pneumothorax to a tension pneumothorax by positive pressure ventilation as with a bag-valve mask device etc.
  – Open pneumothorax that is covered and left unattended developing into a tension pneumothorax
Complications

• Creation of pneumothorax where none existed previously
• Laceration of lung tissue
• Bleeding from laceration of intercostal blood vessels
• Severe pain to conscious patient (since this is life-threatening, the procedure must be continued)
• Local Hematoma
Equipment

The is a sterile technique. All equipment should be placed within easy access and prepared prior to beginning the procedure

- BSI (Body substance isolation)
- 14 Gauge 3 inch over-the-needle catheter
- Flutter valve or one-way valve if available (can be preassembled)
- The flutter valve allows air to escape from the chest, but does not allow air to enter the chest. The flutter valve can be home-made or purchased commercially.
- 10 ml Syringe filled with sterile water or saline if available
Technique

Always assess the A-B-C’s IE: ventilation, oxygenation, perfusion) If patient is conscious, quickly explain the procedure and the need to perform it.

• Open airway; stabilize neck if trauma related
• Apply high flow oxygen via non-rebreather or assist ventilations as necessary with BVM
• Position the patient in the supine position
• Expose the patients chest
Technique (Cont’d)

- Locate the second (2nd) intercostal space mid-clavicular line, or the fifth (5th) intercostals space mid-axillary line
- Prepare the site with aseptic technique using betadine solution (swab)
- Insert the needle at the second intercostal space at the mid-clavicular line, directing the needle just over the top of the third rib to avoid the intercostal vessels and nerves. Nerves and Vessels are inferior the ribs.
Technique (Cont’d)

• After the pleural space is entered you will hear a pop and see bubbles entering the syringe
• Advance the catheter and remove the catheter needle and syringe
• Secure the catheter to prevent removal and attach one-way valve
• Once inserted the catheter can be secured by similar taping techniques used for Intraosseous Infusions using 4X4 sponges or Abdominal pads bunched around the catheter for protection, and wide tape to secure to the chest
Continuous monitoring of the placement must be done

Assist ventilations as needed

This patient will require on-going assessment during treatment and transport

Be prepared to repeat decompression if tension pneumothorax repeats