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By Lawrence Heiskell, MD

# NEEDLE THE CHEST

Don't let tension pneumothorax kill your team member. Learn to release the valve!



» This article focuses on the life-threatening problem of trapped air between the chest wall and the lung, otherwise known as a tension pneumothorax. A tension pneumothorax is believed to cause about one third of combat deaths from penetrating injuries to the chest. These deaths can be reduced or prevented with immediate recognition and treatment. After a victim has suffered a penetrating injury to the chest, a progressive build-up of air can occur. This is usually secondary to an injury such as a gunshot wound or stab wound. The air escapes from the torn or lacerated lung and moves into the area between the chest wall and the lung called the pleural space. A major problem begins when the air cannot return to the lung and with each breath more and more air accumulates in the pleural space.

Essentially what has happened is the creation of a one-way-valve effect. Progressive build-up of air pressure in the pleural space pushes the heart and the major blood vessels exiting and entering the heart to the opposite side of the chest and obstructs venous blood returning to the heart. This leads to circulatory collapse and eventually death if not treated STAT.

## Diagnosis

If your victim has suffered a penetrating injury to the chest, immediately look for the signs of a tension pneumothorax.

- Deviation of the trachea away from the side of the injury (rare, last to present)
- Decreased breath sounds
- Distended neck veins

Unfortunately these classic signs are often absent and more commonly the victim has only a fast heart rate and is having trouble breathing. It is extremely difficult if not impossible to appreciate decreased breath and percussion sounds in a loud tactical or combat situation. A chest x-ray is diagnostic but you are out of luck on this one because all you have is your brain and a needle to save this victim's life.

So what happens if the victim has penetrating injuries to both sides of the chest? The victim may have bilateral tension pneumothorax. The trachea will be found central, while percussion and breath sounds are equal on both sides. These victims are usually found in traumatic arrest. Emergency bilateral chest needle decompression should be done immediately by a trained medical provider.

A simple procedure called needle thoracostomy is used to diagnose and treat a tension pneumothorax. The management of tension pneumothorax is emergent chest decompression with needle thoracostomy. A 14-gauge Angiocath-type (catheter over needle) needle is preferred.

The standard approach is to insert the needle into the second intercostal space at the mid-clavicular line. Remember the blood vessels and nerves which run under the bottom of the rib. The needle is advanced and immediate rush of air out of the chest indicates the presence of a tension pneumothorax. The maneuver essentially converts the tension pneumothorax into a simple pneumothorax, which is typically not a life-endangering situation.

Many clinicians believe that a tension pneumothorax is a clinical diagnosis and should be treated with needle thoracos-

tomy. More recently this dogma has been called into question. Needle thoracostomy may not be as benign a procedure as was previously thought, and may be ineffective in relieving a tension pneumothorax. If no rush of air is heard on needle insertion, it may be impossible to know whether there really was a tension or not, and whether the needle actually reached the pleural cavity.

This is further complicated with recent studies that in buffed-out males the chest wall thickness at the second intercostals space may be greater than the general population, requiring a longer needle. Some recommend a 3.25-inch (8cm) 14 gauge vs. a standard 2-inch or (5cm) needle to ensure reaching the pleural space.

There are many locations on the chest wall where a needle thoracostomy may be performed. If you have a 14-gauge needle that is less than 3.25 inches and your victim has very large chest muscles simply look for a thin area anywhere on the chest wall especially laterally under the arms and insert the needle here. Do not fixate only on the second intercostal space as your only option for needle insertion.

## The Procedure

If available, administer oxygen 12 L/min using a non-rebreather mask or positive

pressure with bag-valve-mask to pre-oxygenate the victim.

- Locate by palpation the 2nd intercostal space in the midclavicular line on the side of the pneumothorax.
- Clean the area with antiseptic.
- Re-identify 2nd intercostal space in the midclavicular line.
- Insert 14 gauge catheter over the top of the rib into the pleural space.
- Listen for a decompression air rush (hissing sound) from the needle, or aspirate as much air as necessary to relieve the victim's acute symptoms. If the symptoms are not relieved, reattempt another needle insertion next to the first one.
- Leave the catheter in place and apply bandage or small dressing. A field-improvised one-way valve may be attached to the catheter. Do not cap off the catheter; air must be able to escape through the needle in order to relieve the tension pneumothorax.
- Transport the victim to the hospital for chest-tube insertion.

Although complications are rare there is a possibility with any procedure. Needle thoracostomies are susceptible to blockage, kinking, and falling out. A relieved tension may re-accumulate undetected. A mis-directed long needle can penetrate the heart or blood vessels in the chest. There is the possibility of lung laceration with the needle. Air embolism through such a laceration is also a real concern.

## Chest Tube Placement

Although some Tactical Medics carry chest tubes in their medical bags for field insertion, at the International School of Tactical Medicine we see little utility or benefit in doing so in the field. Circumstances will dictate who and when a field chest tube should be inserted. Chest tube placement is the definitive treatment of traumatic pneumothorax and requires underwater sealed suction. This invasive surgical procedure should be performed in a controlled setting in an emergency department or hospital by a skilled medical professional.

Remember chest needle decompression can be associated with complications. It should not be used simply because you don't hear breath sounds on one side. However in clear-cut cases such as shock with distended neck veins, reduced breath sounds, deviated trachea after penetration trauma it could be life saving.

## THE ISTM LE CASUALTY RESPONSE KIT

» To save a life in the tactical area, the tactical medic needs the right tools and to be able to utilize them quickly. The faculty at the International School of Tactical Medicine meticulously planned and designed the Law Enforcement Casualty Response Kit and stocked it with high quality components to specifically treat gun-shot wounds, hemorrhage, tension pneumothorax,



sucking chest wounds, eye injuries, burns, lacerations, as well as other injuries that can occur during tactical operations.

The kit can be worn using a tactical drop leg configuration, waist belt attachment, or the standard military molle system. The drop leg attachments can be removed and replaced in seconds. For more information visit [www.tacticalmedicine.com](http://www.tacticalmedicine.com).