

## **PARAMEDIC TIP SHEET #5:** ***Needle Thoracostomy***

### **Indications for Needle Thoracostomy**

Decompression of the chest is indicated when:

- ◆ **Positive signs/symptoms of tension pneumothorax are present**
- ◆ **Cardiac arrest is present with PEA or Asystole, particularly if resulting from trauma**

Patients with tension pneumothorax will appear VERY, VERY Sick. It will usually be obvious that something is definitely wrong. Tension pneumothorax, although uncommon, is an immediately life-threatening condition. Signs and symptoms of tension pneumothorax (particularly if associated with a mechanism of excessive intrathoracic pressure, blunt chest trauma or penetrating chest trauma) include:

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| ◆ <b>Severe respiratory distress</b>                            | ◆ <b>Increased resistance to manual ventilation</b> |
| ◆ <b>Decreased or absent breath sounds (usually unilateral)</b> | ◆ <b>Shock (↑HR, ↓BP)</b>                           |
| ◆ Asymmetric chest expansion                                    | ◆ <b>Hyperresonance to percussion</b>               |
| ◆ Anxiety or restlessness                                       | ◆ JVD (if not hypovolemic)                          |
| ◆ Cyanosis (late sign)  | ◆ Tracheal deviation (VERY late sign)               |

### **Background**

Tension pneumothorax may be caused by a variety of mechanisms. The most likely mechanism is a penetrating injury to the thoracic cavity (e.g. gunshot, stabbing, impaled object). These types of injuries may produce a pneumothorax that is not under tension. If the opening in the visceral pleura and/or parietal pleura creates a one-way valve effect, pressure may increase within the pleural space. This pressure increase is referred to as tension. The tension results in inadequate ventilatory ability, decreased gas exchange capability, asymmetrical chest exam findings, and pressure on the mediastinum (particularly the vena cavae) resulting in inadequate preload. Needle thoracostomy is only indicated for a pneumothorax when signs/symptoms of tension are present OR when cardiac arrest occurs with a mechanism or presentation suspicious of tension pneumothorax. Although rare, a pneumothorax caused by internal forces (e.g. positive pressure ventilation of an asthma patient with severe bronchoconstriction) may lead to a tension pneumothorax. Once again, needle thoracostomy is indicated when signs/symptoms of tension are present.

### **Methods**

*The following needle thoracostomy method assumes that initial care of the patient has already begun and that evidence of tension pneumothorax (or cardiac arrest) exists.*

1. Place the patient in the supine position, if possible. Continue attempts at oxygenation with positive pressure ventilation (BVM or ETT).
2. Obtain a large bore IV catheter (catheter over the needle) and one-way valve. Optional equipment includes a syringe and betadine/proviodine preps.
3. A variety of methods are used to create a one-way valve. Some EMS agencies may purchase specially designed one-way valve referred to as a Heimlich valve. Others use a one-way valve used in fish tank air lines. An older method involves inserting the needle and catheter through the last 1-2 inches of a cut glove fingertip.

*(continued on next page)*

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***Needle Thoracostomy (continued)***

4. Locate the landmarks for insertion. ***Second intercostal space at the midclavicular line on the affected side.***
5. Time permitting, prep the side with betadine/proviodine.
6. Insert the catheter and needle into the second intercostal space at the midclavicular line. Insert directly over the 3<sup>rd</sup> rib. Continue insertion until the catheter hub is against the chest wall. Avoid placing directly under the second rib to reduce the risk of lacerating an artery.
7. Alternate method: Attach a syringe filled with 1-2 cc of saline to the IV catheter and needle. Insert as in step 6 above, aspirating during the insertion.
8. A sudden rush of air may be noted once the needle is removed from the catheter using step 6. Using the alternate method in step 7, air bubbles may be noted in the syringe with the saline solution.
9. Once the needle is removed, tape or otherwise secure the catheter in place. Attach the one-way valve mechanism to the end of the catheter.
10. Reassess the patient and immediately continue treatment/transport.
11. Follow the same procedure for bilateral chest decompression.
12. Continuously reassess for improvement. If the patient's condition improves, then worsens again, assume the first needle may be occluded. Treat the patient with a second needle on the same side.

**Tips**

- ◆ Tension pneumothorax may occur in the patient with a past history of obstructed lung disease or bronchoconstriction that results in "air trapping". This generally occurs when an acute episode of respiratory distress from the disease is treated using positive pressure ventilation.
- ◆ Needle chest decompression should be reserved for the patient with evidence of tension pneumothorax. It is neither indicated nor useful in the patient with a simple pneumothorax or hemothorax.
- ◆ In cardiac arrest with suspected tension pneumothorax, bilateral chest decompression is often performed as it may be difficult to identify a single tension pneumothorax.
- ◆ Tension pneumothorax should be considered early as a possible cause of cardiac arrest, particularly when there is little evidence of hypovolemia. In other words, the patient's shock that led to cardiac arrest may be due to a tension pneumothorax rather than significant blood loss.
- ◆ Some sources suggest an alternative site for decompression as the fourth intercostal space at the mid-axillary line.