

PRACTICE GUIDELINES: PENETRATING CHEST INJURY

OBJECTIVES:

1. Define guidelines for the management of penetrating injuries to the chest.
2. Define an optimal diagnostic strategy and appropriate treatment plans for suspected injuries.

DEFINITION:

Penetrating injury to the chest: A penetrating injury of the thorax in an area bounded superiorly by the lower neck and inferiorly by the lower costal margin. See also: Thoracoabdominal injuries under "Penetrating Injuries to the Abdomen."

GUIDELINES:

1. Any penetrating injury to the chest must be assumed to have caused internal organ damage which may involve the:
 - a. Heart.
 - b. Lungs.
 - c. Tracheobronchial tree.
 - d. Esophagus.
 - e. Great vessels.
 - f. Diaphragm.
 - g. Spinal cord.
2. In all patients, assess the ABC's and obtain an airway as quickly as possible, if necessary.
3. If patient has suffered cardiac arrest and has had signs of life (e.g., pulse or EKG present) at any time (< 10 minutes prior to arrival) or is *in extremis* with low blood pressure, proceed directly to left anterior thoracotomy while the patient is being intubated and large bore intravenous lines are being inserted.
4. In the non-arrested patient, determine whether the patient is hemodynamically stable (normal) or unstable (hypotensive or tachycardic) and whether the patient has respiratory distress.
5. If hemodynamically unstable or has respiratory distress consider:
 - a. Tension pneumothorax:
 - i. Absent breath sounds.
 - ii. Distended neck veins.
 - iii. Shift of the trachea and/or the PMI.
 - iv. Insert large bore chest tube (consider needle thoracostomy to temporize).
 - b. Massive hemothorax:
 - i. Absent breath sounds the affected side.
 - ii. Dull to percussion on affected side.
 - iii. Stabilize blood pressure with vigorous fluid resuscitation.
 - iv. Insert large bore chest tube.
 - v. Take immediately to OR if
 - a) Initial drainage is >1500 ml, or

- b) Drainage continues at >200 ml/hr (>150 ml/hr for elderly patients) for 2-3 hours.
 - a) Consider increasing PEEP (to 10-15 cmH₂O) to tamponade bleeding from lung or chest wall. Discontinue if air leak increases.
 - c. Cardiac tamponade:
 - i. Entry wound between nipples and between suprasternal notch and xyphoid..
 - ii. Distended neck veins.
 - iii. Distant heart sounds.
 - iv. "Blue facies."
 - v. Tension pneumothorax has been treated or ruled out.
 - vi. Perform FAST exam cardiac view only.
 - vii. If FAST cannot be done or is equivocal perform needle pericardiocentesis or open subxiphoid pericardiocentesis.
 - viii. If positive, go immediately to the OR for thoracotomy or median sternotomy.
- 6. If patient is stable and has little respiratory distress, obtain AP supine chest X-ray (mark the entry and exit sites with radio-opaque markers).
- 7. If X-ray shows:
 - a. Pneumothorax: place large bore chest tube.
 - b. Hemothorax: resuscitate the blood volume and place large bore chest tube. Thoracotomy if drainage is higher than thresholds.
- 8. If the wound is below the nipples, this is considered a thoraco-abdominal wound. Refer to Practice Guideline on "Penetrating Abdominal Injury."
- 9. If the injury is in Zone 1 of the neck, consider angiogram, bronchoscopy and esophagoscopy. Refer to Practice Guideline on "Penetrating Neck Injury."
- 10. If the injury is between the nipples and between the clavicle and lower costal margin, consider the possibility of cardiac injury with occult cardiac tamponade:
 - a. Insert CVP to determine central pressure – if it is >20 cm/H₂O, consider cardiac tamponade. This can be done at the time of central line insertion. Elevate open-ended tubing (connected to the CVP catheter) above the chest and determine height of blood column as an easy way of determining CVP.
 - b. Obtain echocardiogram or perform FAST exam to look for pericardial effusion.
- 11. If the injury suggests a trajectory through the lung parenchyma alone:
 - a. Obtain CXR and treat any abnormalities
 - b. obtain a chest CT scan with and without contrast. The bullet track should easily be seen and its relation to the pulmonary hilum and mediastinal structures should be fairly well defined. Treat subsequent hemo/pneumothorax appropriately.
- 12. If all X-rays are normal and there is no firm indication that the pleural space or mediastinum was penetrated, observe for 6 hours and obtain a repeat inspiratory and expiratory chest X-ray.
 - a. If there is a pneumothorax or hemothorax, follow guidelines as above.
 - b. If the film is normal, consider discharge from the ED.