PRACTICE GUIDELINE

Effective Date: **5-21-04** Manual Reference: **Deaconess Trauma Services**

TITLE: BLUNT CHEST TRAUMA

PURPOSE: To define protocols for the diagnosis and management of specific chest injuries that are commonly seen after blunt trauma.

DEFINITION: A chest injury is any injury to the thoracic cage and its contents, including the lungs, heart, great vessels, tracheobronchial tree and the esophagus.

GUIDELINES:

1. Blunt chest injuries are characterized by:
   - A. Mechanism:
     - i. Severe blunt force applied to the chest
     - ii. Rapid deceleration injury
   - B. Signs:
     - i. Chest wall deformity
     - ii. Chest wall contusion
     - iii. Chest wall laceration
     - iv. Severe trauma above the chest (e.g., head injury) and below the chest (e.g., abdominal or pelvic injury)
   - C. Symptoms:
     - i. Tachypnea
     - ii. Pain
     - iii. Absent breath sounds
     - iv. Crepitus or subcutaneous emphysema
     - v. Hemoptysis
     - vi. Hypotension
     - vii. Distended neck veins
     - viii. Paradoxical motion of chest wall segment

2. With any of the above findings, consider the possibility of the following chest injuries:
   - A. Tension pneumothorax
   - B. Open pneumothorax
   - C. Flail chest
   - D. Pulmonary contusion
   - E. Massive hemothorax
   - F. Cardiac tamponade
   - G. Cardiac contusion
   - H. Ruptured diaphragm
   - I. Ruptured tracheobronchial tree
   - J. Ruptured thoracic aorta

K. Ruptured esophagus
L. Myocardial tear
M. Simple pneumothorax
N. Fractured ribs

3. Maintain airway:
   A. Intubate for respiratory distress or airway obstruction
   B. Beware of worsening pneumothorax as pressure is applied to the airway
   C. Consider needle decompression for tension pneumothorax

4. Obtain portable AP chest x-ray on all CAT I patients before going to CT scanner to assess for:
   A. Possible chest injury
   B. Confirm endotracheal tube placement
   C. All transfers who have had a chest x-ray at another facility should have a repeat chest x-ray after arrival.
   D. Chest tubes should be placed prior to the chest x-ray and/or CT scan if there is hemodynamic compromise or any clinical evidence of a pneumothorax.

5. For severe anterior chest trauma, obtain an emergent EKG

6. Treat injury according to the diagnostic findings:
   A. Tension pneumothorax
      i. Treatment:
         a) With hemodynamic compromise: needle decompression followed by chest tube
         b) Chest tube insertion must occur prior to CT scan
         c) >28 Fr chest tube is adequate
         d) Obtain chest x-ray or CT scan of chest **after** the chest tube has been placed

   B. Open pneumothorax:
      i. Treatment
         a) Insert chest tube (size ≥28Fr)
         b) Consider surgical closure of the defect
         c) Intubate once chest tube inserted

   C. Flail chest
      i. Physiology:
         a) Defined by a segment of chest wall which moves paradoxically related to remainder of chest wall. This requires presence of multiple rib fractures as well as muscular damage to chest wall, and is often associated with significant underlying pulmonary contusion.
      ii. Treatment:
         a) Pain control: epidural, PCA, morphine drip
         b) Pulmonary toilet, monitor vital capacity

c) Intubate for hypoxia, respiratory distress, or increasing pCO2
d) Judicious fluid and pain management

D. Pulmonary contusion
i. Treatment:
a) Pulmonary toilet, monitor vital capacity
b) Intubate for respiratory distress, hypoxia, or increasing pCO2
c) Judicious fluid management

E. Massive hemothorax
i. Treatment:
a) Fluid resuscitation to correct hemorrhagic shock
b) Place ≥28 Fr chest tube
c) If initial drainage > 1500 ml or drainage continues at >200 ml/hr for more than two hours, then consider operative intervention
d) Signs of shock not corrected by initial resuscitation should undergo emergent thoracotomy for hemorrhage control
e) Consider autotransfusion

F. Cardiac tamponade
i. Physiology:
a) Should be suspected in penetrating trauma to cardiac box and blunt trauma shock when hemorrhage shock has been excluded
ii. Diagnosis:
a) FAST should be performed to assess for pericardial fluid
iii. Treatment:
a) IV fluid bolus.
b) Pericardiocentesis
c) Pericardial window.
d) If positive, immediately go to OR for median sternotomy or thoracotomy

G. Cardiac Contusion
i. Physiology:
a) Should be suspected with blunt chest trauma when new arrhythmias and/or non-hemorrhagic shock is noted
ii. Treatment:
a) With high suspicion, obtain echocardiogram (transthoracic or preferably TEE)
b) Monitor telemetry for 24 hours in the hospital
c) Treat arrhythmias
d) Treat cardiac dysfunction
e) Obtain cardiology consult
f) Treat any cardiac failure with inotropes

H. Ruptured diaphragm:
   i. Treatment
      a) Operative repair through the abdomen
      b) If diagnosis is delayed, may need a thoracotomy

I. Ruptured tracheobronchial tree
   i. Physiology:
      a) Usually presents as either pneumothorax and/or pneumomediastinum. Should be suspected if pt continues with large air leak via chest tube, especially if continuous air leak prevents lung re-expansion
   ii. Diagnosis:
      a) When suspected, diagnosis should be confirmed via bronchoscopy
   iii. Treatment
      a) Operating room for thoracotomy and operative repair. Consider temporary balloon occlusion via ETT to aid in repair
      b) Avoid high pressure when ventilating when possible

J. Ruptured thoracic aorta
   i. Physiology:
      a) Should be considered if in mechanisms where severe acceleration/deceleration is present
   ii. Treatment:
      a) Avoid hypertension, using beta-blocker with vasodilator if necessary (with vasodilator avoid tachycardia)
      b) If shock is present must find and treat other sources, as ruptured aorta is rarely if ever the source of hemorrhagic shock
      c) Once other source of shock confirmed, operative, or more frequently endovascular repair should be performed
      d) Consult cardiothoracic surgery
      e) When definitive repair must be delayed, hypertension should be avoided

K. Ruptured esophagus
   i. Physiology:
      a) Should be suspected with blunt chest or upper abdomen trauma when pneumomediastinum is present
   ii. Treatment:
      a) Confirm with esophagoscopy or gastrograffin swallow (preferred).
      b) Thoracotomy for surgical repair. Approach will depend on segment of esophagus injured

L. Simple pneumothorax
   i. Treatment
      a) ≥28 Fr chest tube should be inserted in patients with traumatic pneumothorax seen on plain chest X-ray

b) Occult pneumothorax seen on CT scan without plain x-ray findings can be treated without chest tube. If patient goes to the operating room, is intubated or is transferred by air ambulance, then chest tube should be considered. In all cases of occult pneumothorax managed without chest tube, expansion of pneumothorax should be suspected and repeat chest x-ray should be performed within 24 hours

M. Fractured ribs
   i. Treatment
      a) Pain control by epidural or PCA
      b) Pulmonary toilet
      c) Drain intrapleural fluid accumulation with chest tube; 28 Fr tubes should be used instead of larger tubes as studies show equal effectiveness of draining hemothorax
      d) Surgical Rib Fixation

N. Retained hemothorax
   i. Treatment
      a) Should be ruled out with serial Chest x-rays for patients with chest tubes placed for hemothorax
      b) If suspected on serial Chest x-ray at 3 days after chest tube placed, repeat CT of chest should be performed and video assisted thoracoscopic surgery (VATS) performed to fully evaluate if present

REFERENCES:

- Deaconess Trauma Guideline Manual, PATIENT IN EXTREMIS FLOWCHART; TRAUMATIC ARREST; EVALUATION OF THE WIDENED MEDIASTINUM; EMERGENCY RESUSCITATIVE THORACOTOMY.
- Deaconess Critical Care Department Policy & Procedure Manual, AUTO TRANSFUSION A-13.

REVIEWED DATE	REVISED DATE
JAN 05	JAN 08
JAN 06	2 Jul 2016
JAN 07	FEB 17
OCT 11	
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