Chapter 19
Thoracic Trauma

Chapter Goal
- Integrate pathophysiological principles & assessment findings to formulate field impressions & implement treatment plan for patients with thoracic trauma

Learning Objectives
- Describe incidence, morbidity, & mortality of thoracic injuries in trauma patient
- Predict thoracic injuries based on mechanism of injury
- Discuss types of thoracic injuries
- Discuss pathophysiology of thoracic injuries
- Discuss assessment findings associated with thoracic injuries
- Discuss management of thoracic injuries
Learning Objectives

- Identify need for rapid intervention & transport of thoracic injury patients
- Describe MOI, signs & symptoms, & management of:
  - Clavicular fracture
  - Rib fracture
  - Sternal fracture
  - Closed or simple pneumothorax
  - Open pneumothorax
  - Tension pneumothorax
  - Hemothorax
  - Hemopneumothorax
  - Pulmonary contusion
  - Myocardial contusion

- Describe MOI, signs & symptoms, & management of:
  - Pericardial tamponade
  - Myocardial rupture
  - Aortic rupture
  - Esophageal and tracheal/bronchial injuries
  - Diaphragmatic rupture
- List 2 early & late signs or symptoms of tension pneumothorax
- State importance of rapid transport to definitive care

Introduction

- 16,000 deaths per year
- 2nd leading cause
- Can be caused by blunt or penetrating mechanisms
Pathophysiology

- Thoracic injuries that interfere with ventilation:
  - Rib fracture
  - Sternal fracture
  - Flail chest
  - Pulmonary contusion
  - Closed/simple pneumothorax
  - Open pneumothorax
  - Tension pneumothorax
  - Esophageal, tracheal, & bronchial injuries
  - Diaphragmatic rupture
  - Traumatic asphyxia

Pathophysiology

- Rib fracture
  - Simple fracture usually not life-threatening
  - Patient’s age and number & location of fractures influences morbidity & mortality
  - Management
    - Splint chest using sling & swathe

Pathophysiology

- Sternal fracture
  - Serious injury
  - Possible associated unstable chest wall, myocardial injury, cardiac tamponade
  - Look for rib fractures, long bone fractures, closed head injuries
  - Management
    - Cardiac monitor
Pathophysiology

- Flail chest
- Paradoxical movement
- Pulmonary contusion
- Closed or simple pneumothorax
  - Life-threatening
  - Common cause—fx rib
  - Spontaneous pneumothorax

Closed or simple pneumothorax

- Life-threatening
- Common cause—fx rib
- Spontaneous pneumothorax

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Pathophysiology

Open pneumothorax

Pathophysiology

Open pneumothorax treatment
- Cover with gloved hand, then with occlusive dressing taped on 3 sides

Pathophysiology

Tension pneumothorax

During inspiration, the mediastinum shifts toward the unaffected lung, impeding ventilation.

During expiration, the mediastinum shifts down, the heart shifts, and reduces cardiac output.
Pathophysiology: Needle Thoracentesis

- Assemble needle
- Locate 2nd or 3rd intercostal space
- Cleanse area

- Insert needle; slide it over rib
- Remove needle from catheter
- Attach 1-way valve to catheter; secure

Pathophysiology:

- Esophageal, tracheal, & bronchial injuries
  - May produce hemothorax, pneumothorax, subcutaneous emphysema

- Diaphragmatic rupture
  - Multiple injuries may be present
Pathophysiology: Traumatic Asphyxia

- Severe crushing injury to chest & abdomen
  - ↑ Intrathoracic pressure that forces blood from right side of heart to veins of upper thorax, neck, & face
  - Often fatal

Pathophysiology

- Thoracic injuries that interfere with circulation:
  - Hemothorax
  - Hemopneumothorax
  - Myocardial contusion
  - Pericardial tamponade
  - Myocardial rupture
  - Aortic rupture

Pathophysiology

- Hemothorax
  - Blood within pleural space

- Hemopneumothorax
  - Air & blood within pleural cavity

- Myocardial contusion
  - Extent from bruise to full-thickness injury to wall of heart
Pathophysiology

- Pericardial tamponade
  - Sac around heart fills with blood; compresses heart

- Myocardial rupture
  - Ventricle compress forcefully and rupture chamber wall, septum, or valve

Pathophysiology

- Aortic rupture
  - High-energy injury

Assessment

- Index of suspicion based on:
  - MOI and outward signs of trauma
  - Presence of dyspnea or cyanosis
  - Level of shock greater than from obvious injuries

- Expose chest; look for injuries
- Palpate chest
- Look for guarding and/or tenderness
- Auscultate breath sounds
Management

• High-concentration O$_2$
• Assist ventilation as needed; consider ET
• Use PEEP per local protocol

Summary

• Thoracic trauma caused by blunt or penetrating injuries
• A simple or closed pneumothorax may become life-threatening
• An open pneumothorax may result in severe ventilatory dysfunction, hypoxemia, & death

Summary

• Hemothorax may result in massive blood loss, leading to hypovolemia & hypoxemia
• Pulmonary contusion results when trauma to lung causes alveolar & capillary damage
• Traumatic asphyxia occurs when forces cause increase in intrathoracic pressure
• Extent of injury from myocardial contusion may vary from localized bruise to full-thickness injury to heart wall
Myocardial rupture refers to acute traumatic perforation of ventricles or atria.

Aortic rupture is a severe injury with 80%–90% mortality in the first hour.

Esophageal injuries are most frequently caused by penetrating trauma.

Diaphragmatic ruptures may allow intraabdominal organs to enter the thoracic cavity.

Care for patients with thoracic trauma begins with careful airway management, with close attention given to protecting the cervical spine.

Bleeding is controlled by broad manual pressure; open wounds are dressed.

Impaled objects are left in place.

Unresponsive patients are transported in the supine position and immobilized on a long backboard.

Patients with multisystem trauma require rapid transport to an appropriate facility.

Prevention of thoracic trauma is another important role.