Chapter 22

Chest and Abdominal Emergencies

Learning Objectives

- Discuss emergency medical care considerations for patient with penetrating chest injury
- Differentiate care of an open wound to the chest from an open wound to the abdomen
- Establish the relationship between airway management & the patient with chest injuries
- State emergency medical care considerations for patient with an open wound to abdomen

Learning Objectives

- Relate anatomy to the mechanism of injury to determine potential organ damage
- State emergency medical care considerations for patient with nontraumatic, acute abdominal distress
- Recognize a patient with an acute abdomen
- Discuss emergency medical care considerations for acute abdomen
Introduction

- Thoracic & abdominal cavities
  - Highly vascular, contain vital organs
  - Injury results in:
    - Hemorrhage
    - Damage to organs
    - Death
  - Both cavities large enough to contain body’s entire blood volume, concealing internal bleeding

Introduction

- Thoracic & abdominal cavities
  - Damage to vital organs in chest can result in respiratory compromise or cardiac failure
  - Injury to organs in abdomen can result in bleeding and leakage of content of hollow organs within abdominal cavity
  - Early recognition of thoracic & abdominal injury is aided by working knowledge of anatomy & physiology
  - Based on MOI, you can anticipate organ injuries and search for related signs

Introduction

- Management
  - Application of airtight, occlusive dressings
  - Stabilization of multiple rib fractures
  - Ventilation and oxygenation
  - Organs may extrude (evisceration), requiring special handling
  - Understand importance of injuries
  - Learn signs of injury requiring emergency care at scene and early transport
Chest

Anatomy & physiology

Thoracic cavity
- Begins just below neck, extends to diaphragm

Rib cage
- Surrounds thoracic cavity on both sides
- Provides structure for ventilation
- Protects vital organs
- Upper 10 pairs of ribs
- 11th, 12th pair ribs
- Sternum composed of three separate bones

Clavicles or collarbones
- Lie over anterior upper ribs, extend from sternum to shoulders

Scapulae or shoulder blades
- Lie over upper posterior ribs
- Attach to clavicles and humerus to form shoulder
- Bony tip of shoulder is acromion (acromial process)
Chest

- **Anatomy & physiology**
  - **Diaphragm**
    - Dome-shaped muscle that forms base of thoracic cavity
    - Contracts and pushes down into abdomen, expanding size of thoracic cavity, allowing air to enter lungs during inspiration
    - Relaxes and rises within thoracic cavity during expiration
    - Forms division between thoracic and abdominal cavities
    - Moves when breathing; the boundaries between 2 cavities may move as well

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Chest

- **Anatomy & physiology**
  - **Attachments of diaphragm**
    - Xiphoid process of sternum
    - Lower 6 ribs
    - Upper lumbar vertebrae
    - Openings in diaphragm for aorta, venae cavae, and esophagus

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Chest

- **Anatomy & physiology**
  - **Contained within thoracic cavity**
    - Heart
    - Lungs
    - Great vessels (venae cavae, aorta)
    - Esophagus travels through middle of thoracic cavity posterior to trachea
Chest

- Anatomy & physiology
  - Thoracic cavity subdivided in 2 smaller spaces
    - Mediastinum in center
    - Pleural spaces on either side

Chest

- Chest injuries
  - Mechanism of injury
    - Motor vehicle collisions (MVCs), major cause of severe blunt injury to chest
    - Deceleration injuries occur to structures that have both mobile and fixed portions
    - Penetrating injuries can strike vital structures

Chest

- Chest injuries
  - Rib fractures
    - If isolated, usually not serious emergency
    - Broken ribs can puncture lung or blood vessel
    - Fracture of lower ribs may signal injury to abdominal organs underneath
    - Most often the results of blunt trauma
    - Complaints
      - Increased pain with breathing when moved
      - To avoid pain, patient tends to reduce movement of the injured area, called “splinting”
      - Local tenderness, crepitus can be felt
Chest injuries

- Flail chest
  - >2 ribs fractured in >2 places
  - Portion of chest wall unstable, alters mechanics of breathing

- Mechanisms of injury
  - Depending on mechanism of injury, observe for:
    - Paradoxical motion during breathing
    - Flail segment tender, movable during palpation
    - Underlying injury, pneumothorax
    - Diminished breath sounds
    - Flail segments can range from small areas of to separation of entire sternum from anterior thorax
Chest

- Chest injuries
  - Flail chest
    - Management
      - Supplemental O₂
      - Paradoxical motion noticeable
    - Continued inadequate breathing
      - Positive-pressure ventilation

- Chest injuries
  - Traumatic asphyxia
    - Results from severe compression of thorax
    - Heart compressed; blood in veins is driven into upper thorax, neck, brain
      - Causes severe swelling, ecchymosis of neck and face
      - Discoloring, swelling
      - Associated injuries to heart, lungs, chest wall with or without inability to breathe are all life threatening
    - Management
      - High-concentration O₂
      - PPV, as needed
Chest

- Chest injuries
  - Pneumothorax
    - Collection of air in pleural space that results in lung collapse
    - Occurs when air enters normally closed space between linings of chest wall and lungs (visceral and parietal pleurae)
    - Causes of pneumothorax
      - Blunt or penetrating trauma may puncture or damage chest wall or lung
      - Lung may spontaneously rupture, result of bleb, blisterlike defect in lung tissue

- Open pneumothorax
  - Chest wall punctured, hole in wall stays open
  - Air drawn into pleural space during inspiration
  - Larger the hole, more serious effect on breathing
  - Patient with pneumothorax may complain of difficulty breathing and chest pain that is worse with breathing
  - Take immediate action to restore mechanics of breathing, seal open wound
  - Penetrating wound discovered on chest wall

- Penetrating wound discovered on chest wall
Skill 22-1: Management of Open Chest Wound

- Assess open wound on chest wall
- If airtight dressing not immediately available, cover hole with gloved hand

Skill 22-1: Management of Open Chest Wound

- Apply airtight dressing of plastic wrap, tape on 3 sides
- Apply airtight dressing of gauze, extend 2" in each direction over wound

Chest

- Chest injuries
  - Pneumothorax
    - Closed pneumothorax
    - Pneumothorax without open wound
      - Injury can occur when broken rib pierces lung, air enters pleural space
      - Complaints
      - Management
Chest

- Chest injuries
  - Pneumothorax
    - Tension pneumothorax
      - Air entering chest cavity becomes trapped within pleural space
      - Air enters pleural space during inspiration, cannot exit during exhalation

- Chest injuries
  - Tension pneumothorax
    - Open chest wounds function as 1-way valves
    - Signs:
      - Absent breath sounds on affected side
      - Distended neck veins
      - Signs of shock, such as tachycardia and hypotension
      - Shifting of trachea away from affected side
    - If signs develop after airtight dressing, remove dressing immediately
    - Signs developed after blunt trauma or with a spontaneous pneumothorax
Chest

- Chest injuries
  - Hemothorax
    - Blood vessel in chest cavity injured, blood accumulates in pleural space
    - Result of penetrating or blunt trauma, bleeding can be severe enough to cause shock
    - Both hemothorax and pneumothorax can occur independently or in combination
    - Management

- Chest injuries
  - Pulmonary contusion
    - Severe blows to chest wall resulting in bruising of lungs
    - Swelling, fluid backup that result within lung tissue decrease diffusion of O₂ into capillaries
    - May not initially be evident, it can progress during 1st hours after surgery
    - Management
Chest

- Chest injuries
  - Pericardial tamponade
    - Mechanical compression of heart by large amounts fluid or blood within pericardial space
    - Penetrating wound to heart can cause bleeding in space between heart and its covering (pericardium)
    - Need rapid hospital intervention

- Chest injuries
  - Aortic tear
    - Torn by deceleration forces; shearing forces tear aorta where mobile and attached portions meet
    - Blood loss so severe and immediate that 80% patients die at scene
    - Signs:
      - Chest pain or shortness of breath
      - Inadequate blood flow to extremities

Abdomen

- Anatomy & physiology
  - Abdominal cavity bounded by:
    - Diaphragm superiorly
    - Bony pelvic cavity inferiorly
    - Spine posteriorly
    - Sides and anterior portions protected by layers of muscle
Abdomen

- Anatomy & physiology
  - Abdominal cavity organs of digestion and excretion
    - Stomach
    - Small and large intestines
    - Liver
    - Gallbladder
    - Pancreas
    - Kidneys
    - Ureters
    - Spleen
Abdomen

- Anatomy & physiology
  - Abdominal cavity
    - "Pelvic girdle" ring of bones formed by
      - Sacrum
      - Left, right ilium
      - Left, right ischium
      - Left, right pubis
      - Provides protection of pelvic organs
      - Top of ilium bone; iliac crest
      - Point pubic bone meets anteriorly; pubic symphysis

- Abdomen
  - Anatomy & physiology
    - Abdominal cavity
      - Pelvic bone bleeds heavily and cause injury to pelvic organs when fractured
      - Peritoneum; lining of inner abdominal wall
        - 2 parts
          - Parietal
          - Visceral
      - Peritonitis
      - Kidneys and other major structures are located behind peritoneum

- Abdomen
  - Anatomy & physiology
    - Abdominal cavity
      - Abdominal quadrants
Abdomen

- Abdominal pain
  - Transmitted by 2 pain pathways
    - Visceral
    - Somatic
    - "Referred" pain

Abdomen

- Abdominal injuries
  - Large vessels and highly vascular organs within abdomen, injuries can result in rapid blood loss and death
  - Maintain high level of suspicion
  - Most common causes
  - Primary goal
  - Most require surgical intervention

Abdomen

- Abdominal injuries
  - Evisceration
    - Special circumstances requiring prehospital handling and dressing
Abdomen

- Abdominal injuries
  - Mechanism of injury
    - Internal bleeding may not be obvious
    - Remain alert for early signs of shock
  - Look for signs of peritonitis
  - Blunt abdominal trauma
  - Compression injuries
    - 2 opposing forces compress intraabdominal organs resulting in contusions, tears, or ruptures

Abdomen

- Abdominal injuries
  - Mechanism of injury
    - Deceleration Injuries
    - Seat belt injuries
    - Penetrating trauma

Abdomen

- Abdominal injuries
  - Assessment & management
    - Injury hidden within abdominal cavity
    - Identify life-threatening problems
    - Scene size-up
Abdomen

Abdominal injuries

- Initial assessment
  - Begin search for hypovolemia
  - Poor skin perfusion
  - Rapid thread pulse
  - Rapid breathing
  - Sweaty skin
  - Hypotension and AMS are late signs of shock

Abdomen

Abdominal injuries

- Focused secondary assessment
  - Look for bruises, tire marks, and seat belt marks on abdominal wall
  - DCAP-BTLS
  - Evaluate ribs
  - Palpate abdomen
  - Ask pain location before examining abdomen; examine that portion last

Abdomen

Abdominal injuries

- Focused secondary assessment
  - Factors mask signs of severe injury
    - Alcohol and drugs
    - Head or spinal injuries
    - Elderly or taking beta blockers
Abdomen

- Abdominal injuries
  - Focused secondary assessment
    * SAMPLE history note
    * Signs and symptoms
    * Allergies
    * Medications
    * Pertinent past medical history
    * Last oral intake
    * Events leading up to trauma

Abdomen

- Abdominal injuries
  - Management
    * Definitive care should be at hospital
    * Immobilize spine, treat life-threatening injuries
    * Maintain airway
    * High concentration O₂

Abdomen

- Abdominal injuries
  - Management
    * Control external bleeding
    * Secure penetrating objects in place
    * Dress open wounds
    * Treat for shock
Abdomen

- Abdominal injuries
  - Management
    - Position according to need
    - Give nothing by mouth, may need surgery
    - Complete examination en route to hospital
    - Select hospital by local protocols for trauma center candidates

- Special consideration
  - Evisceration
    - Presence of abdominal contents, usually intestines, protruding through abdominal wall
    - Do not attempt to put back in abdominal cavity
Skill 22-2: Management of Evisceration

- Assess evisceration
- Place moistened multitrauma dressing around exposed viscera

Skill 22-2: Management of Evisceration

- Cover with dry, sterile dressing, tape in place
- Cover exposed area with plastic wrap, tape completely around border to ensure airtight seal

Abdomen

- Abdominal injuries
  - Special consideration
    - Urinary tract injuries:
      - Can have various presentations
      - Kidney injuries suspected with bruises over flank
      - Pelvic injuries cause bladder or urethra tears
      - Direct injuries to male genitalia can result in:
      - Direct injuries to female genitalia
Abdomen

- Abdominal injuries
  - Special consideration
    - Leave penetrating objects in abdomen, removal at hospital
    - Stabilize object with bulky dressing on all sides, secure with tape
    - If impaled object, large, cut so patient can be moved with object stabilized in place

Acute Abdomen

- Pain of recent onset
  - Not traumatically induced
    - Infection
    - Obstruction or occlusion
    - Perforation
    - Nontraumatic bleeding
    - Chronic organ failure
  - Outcome depends on early diagnosis and surgical intervention

Acute Abdomen

- Digestive system
  - Function: break down foods
    - Mechanically by chewing in mouth and churning in stomach and intestines
    - Chemically by acids and enzymes, that are secreted into mouth, stomach, intestines
Acute Abdomen

Digestive system

Esophagus

- Travels through chest cavity just posterior to trachea
- Enters abdominal cavity through diaphragm
- Uses peristalsis
- Esophageal disorders cause complaints of indigestion or heartburn
- Disorders confused with MI

Hemorrhage

- Esophagus may be site
- Patients with severe liver disease, often related to heavy alcohol use may have esophageal varices
- Varix may rupture, result in massive bleeding

Esophageal perforation

- Forceful vomiting or retching can cause tears that cause pericardial effusion
- Ingestion of caustic or corrosive substances
- Life-threatening, requires immediate surgical intervention
Acute Abdomen

- Digestive system

  - Stomach
    - J-shaped organ
    - Located in LUQ
    - 2 openings
    - Expands to 10X empty size
    - Stores, breaks down food

- Ulcers & gastritis
  - Common disorders
  - Gastric juices work on organ’s own lining
  - Patient often has a past medical history of ulcer or gastritis
  - May be taking certain medications
  - Bleeding is greatest concern
  - Abdominal pain associated with hematemesis, melena, or signs of hypovolemic shock suggests bleeding ulcers

- Small intestine
  - Located in central part of abdominal cavity throughout all 4 quadrants
  - Range from 10 to 20 feet (3 to 6 m) in length
  - Provides large surface area through which nutrients absorbed
  - Divided into 3 segments
  - Most common emergency: duodenal ulcers
  - 2nd most common: obstruction
Acute Abdomen

- Digestive system
  - Hernia
    - Outpocketings of peritoneum into abnormal openings in abdominal wall
    - Most common is inguinal
  - Intestinal obstruction
    - Twisting around scars from previous surgery
    - Internal cause; foreign body lodged in lumen
    - Pain is diffuse, cannot be described as arising from particular area

- Digestive system
  - Pancreas
    - Secretes digestive enzymes into digestive tract to breakdown food
    - Secretes hormone insulin into blood to regulate glucose
    - Extends across upper abdomen, behind stomach, in front of spine, into retroperitoneal space
    - Common problems
      - Diabetic states
      - Pancreatitis

- Digestive system
  - Pancreatitis
    - Exists in 2 forms; acute and chronic
    - Can be life threatening
    - Caused by inflammation of pancreatic tissues
    - Attack begins with sudden, severe epigastric pain that radiates to back
    - Pain; “knife-like”
    - Eating or drinking worsens symptoms
Acute Abdomen

- Digestive system
  - Pancreas
    - Pancreatitis
    - Signs:
      - Vomiting
      - Fever
      - Tachycardia
      - Ecchymosis, seen in severe cases in periumbilical region or over flank
      - Hypovolemic shock

- Digestive system
  - Liver
    - Large, solid, soft organ
    - Located in RUQ of abdomen
    - Main function; filter toxins from blood
    - When overwhelmed by toxins, liver failure may occur
    - Produces proteins that play important role in fluid balance and blood clotting
    - Patients with severe liver disease are at an increased risk for bleeding

- Digestive system
  - Liver
    - Liver disease
      - Alcohol consumption is major cause; leads to hepatitis or cirrhosis
    - Liver failure signs:
      - Vomiting
      - Lethargy
      - Anorexia
Acute Abdomen

- Digestive system
  - Gallbladder
    - Stores and concentrates bile produced by liver
    - Under liver in RUQ of abdomen
  - Cholecystitis
    - Major medical emergency
    - Gallstones (cholesterol, bile pigment, and calcium) block bile exit from gallbladder
    - Becomes distended and inflamed
    - Initial complaint RUQ pain
    - Tenderness on palpation of abdomen in RUQ would favor gallbladder disease

- Digestive system
  - Large intestine
    - Begins in RLQ, continuing flow of digestive contents from ileum
    - Cecum
    - Appendix
    - Ascending colon
    - Transverse colon
    - Descending colon
    - Sigmoid colon
    - Rectum

- Digestive system
  - Large intestine
    - Diverticula
      - Common, usually asymptomatic
      - Outpouching of inner wall of bowel tissue into muscle layer of bowel
      - Most often occurs in left side of large intestine
      - Occurs near arteries, may cause painless bleeding
      - Bleeding may become severe
Acute Abdomen
- Digestive system
  - Large intestine
    - Diverticula
  - Intestinal obstruction
    - Bowel twists on itself in areas where mobile - sigmoid colon
    - Cancerous tumor can encroach on lumen and patient may note narrow stools before complete obstruction
    - Large-bowel obstruction

Acute Abdomen
- Digestive system
  - Appendicitis
    - Most common surgical emergency
    - Occurs when bowel contents become clogged in lumen of appendix
    - Pain begins mild and vague; when further distention occurs, there is more severe pain with loss of appetite, vomiting, and nausea
    - Left untreated, appendix becomes gangrenous and ruptures; spilling contents into peritoneum
    - Definitive therapy for appendicitis; surgery
    - Physical examination
    - Surgery is definitive therapy
Acute Abdomen

- Urinary system
  - 2 kidneys
  - 2 ureters
  - Urinary bladder
  - Urethra
  - External genitalia
  - Regulates fluid volume, salt concentration, filter blood of toxins

- Kidneys & ureters
  - Located in retroperitoneum, high up posterior abdominal wall just under diaphragm
  - Large portion protected by posterior rib cage
  - Connected to urinary bladder by tubes called ureters
  - Slightly mobile, can move with respiration

- Highly vascular organ
  - When body is overhydrated, kidneys excrete larger volumes of water
  - When body is dehydrated, kidneys conserve water, urine output is restricted
  - In severe hypovolemic states caused by bleeding, diarrhea, or other problems, kidneys may shut down completely
  - Filter toxins in blood
Acute Abdomen

- Urinary system
  - Kidneys & ureters
    - Renal failure
      - Decreased blood flow, shocklike state
      - Intrinsic renal disease from infection
      - Drug reactions
      - Uncommon systemic disease
      - Obstruction to urine outflow, at ureter or urethra
      - Chronic renal failure (CRF) caused by diabetes, hypertension
      - Requires dialysis, artificially filters blood

Acute Abdomen

- Urinary system
  - Kidneys & ureters
    - Pyelonephritis
      - Most common emergency related to kidneys
      - Severe infection of kidney, affects women more than men
      - Risk factors

Acute Abdomen

- Urinary system
  - Kidneys & ureters
    - Pyelonephritis
    - Symptoms:
      - High fever
      - Shaking chills
      - Abdominal or back pain
      - Nausea or vomiting
      - Diarrhea
      - Dysuria
      - Pain in flanks, below ribs, above ilium
      - Urine usually contains pus or blood
Acute Abdomen

Urinary system
- Kidneys & ureters
  - Kidney stones
    - Form when excess amounts of certain products accumulate in urine
    - Renal colic is caused by passage of stone from kidney into ureters
    - Causing partial or total obstruction of urine flow
    - With peristaltic waves of ureter come spasms of intermittent pain
    - Blood in urine

- Urinary bladder & urethra
  - Located anteriorly, low in pelvis
  - When distended with urine, it can be felt in lower abdomen
  - Ureters bring urine to bladder from kidneys
  - Function: store urine

- Bladder emergencies may result from infections
  - Occur more in women, rarely serious enough to require EMT assistance
  - If left untreated, can ascend and involve kidneys
  - Pelvic pain
  - Difficult or painful urination
  - Blood in urine
  - Fever
  - Subcostal tenderness
  - Voluntary guarding
Acute Abdomen

Reproductive system

- Male reproductive system
  - Testicles (testes)
  - Epididymis
  - Seminal vesicles
  - Prostate gland
  - Penis
  - Urethra
  - Vas deferens
  - Scrotum (pouch with testes, epididymis)

Acute Abdomen

Reproductive system

- Male reproductive system
  - Medical complaints
    - Acute urinary retention
    - Testicular torsion
    - Infections

Acute Abdomen

Reproductive system

- Female reproductive system
  - Potential to cause acute abdomen
Acute Abdomen

● Assessment
  ➢ Difficult to diagnose cause of abdominal pain in field
    • Many patients need timely hospital interventions
      ➢ Focus on identifying life-threatening conditions
      ➢ Transport to hospital ASAP

Acute Abdomen

● Assessment
  ➢ Findings indicative of acute abdomen:
    • Positioned to avoid movement of abdomen
    • Distended, tense abdomen
    • Abdominal tenderness
    • Abdominal guarding
Acute Abdomen

Assessment

- Initial (primary) assessment
  - Signs of shock present
  - Early steps
  - Transport position

- Patient history
  - Pain, bleeding; common chief complaints
  - Associated complaints
    - Weakness
    - Vomiting
    - Change in bowel habit
    - Inability to urinate
    - Gather SAMPLE history with OPQRST

- Focused (secondary) assessment
  - Look for findings associated with abdominal complaints during focused physical assessment
  - Look for jaundice in sclera or skin
  - Look for dehydration, such as dry lips and skin
  - Note whether lying still or moving in unsuccessful attempt to find position of comfort
  - Inspect abdomen, looking for distention and scars from previous surgery
Acute Abdomen

Assessment
- Focused assessment
  - Lightly touch abdomen, feel whether tense or soft
  - Ask patient to point to pain
  - Palpate painful area last
  - Gently palpate abdomen with pads of fingertips in each quadrant
  - Note areas of tenderness
  - Look for firmness or rigidity of abdominal wall muscles
  - Is pain generalized or localized to 1 quadrant
  - Note presence of masses

Management
- Acute and injured is generally the same
- Treatment for major abdominal emergencies takes place in hospital
- Rapid transport and shock treatment may be required
Summary

- Chest, abdomen are large cavities that can hold entire blood volume, mask severe internal bleeding.

- Signs of rib fractures include pleuritic chest pain, splinting of chest wall, bruising on chest wall.

- Flail chest defined as 2/more ribs fractured in 2/more places.

- Flail chest is treated by splinting chest, providing positive-pressure ventilation.

Summary

- Pneumothorax (air in the pleural space) may be traumatic/spontaneous, open/closed.

- Signs of pneumothorax include open chest wound, pleuritic chest pain (pain during breathing), subcutaneous emphysema, dyspnea, absent/diminished breath sounds on affected side, signs of inadequate breathing.

Summary

- Open chest wounds are treated by applying 3-sided occlusive dressing to wound to prevent air from entering pleural space, while allowing air to escape, preventing tension pneumothorax.

- Tension pneumothorax is caused by air trapped in pleural space. Tension can be exerted on the diaphragm, heart, great vessels, which can obstruct venous return, result in shock.
Summary

- Signs of tension pneumothorax include dyspnea, absent/diminished breath sounds on affected side, distended neck veins, tracheal shift, other signs of shock
- If an occlusive dressing is applied & dressing until signs of tension are alleviated
- Pericardial tamponade caused by buildup of blood/fluid in space between heart, sac around heart, causing pressure, obstruction of venous return

Summary

- Signs of pericardial tamponade include distended neck veins, narrow pulse pressure (minimal difference between the systolic and diastolic pressures), signs of shock
- Eviscerations are treated by placing dressing moistened with sterile water around bowel and covering with dry dressing

Summary

- Position of transport for patients with abdominal injuries is dictated by need for airway management, spinal immobilization, position of comfort. Patients with abdominal pain often prefer to be placed supine with legs flexed
- An acute abdomen is nontraumatically induced abdominal pain of recent onset
Summary

- Acute abdomen can be caused by following:
  - Intestinal obstruction
  - Infection
  - Hemorrhage
  - Perforation
  - Renal failure

Questions?