Chapter 50
Abdominal Trauma

Learning Objectives

- Describe the epidemiology, including morbidity, mortality rates, and prevention strategies, for abdominal trauma
- Describe the anatomy, physiology of organs, structures related to abdominal injuries
- Predict abdominal injuries on the basis of blunt, penetrating mechanisms of injury

Learning Objectives (Cont'd)

- Describe open and closed abdominal injuries
- Explain the pathophysiology of abdominal injuries
- Describe assessment findings associated with abdominal injuries
Learning Objectives (Cont'd)

- Identify the need for rapid intervention and transport of the patient with abdominal injuries based on assessment findings
- Integrate pathophysiological principles into the assessment of abdominal injury
- Differentiate abdominal injuries on the basis of assessment of the patient and his or her history

Learning Objectives (Cont'd)

- Formulate a field impression for patients with abdominal trauma on the basis of assessment findings
- Apply epidemiological principles to develop prevention strategies for abdominal injuries
- Integrate pathophysiological principles into the assessment of the patient with abdominal injuries

Learning Objectives (Cont'd)

- Describe the management of abdominal injuries
- Develop a management plan for abdominal trauma on the basis of field impression
- Describe the epidemiology, including morbidity, mortality rates, and prevention strategies, for hollow organ injuries
Learning Objectives (Cont’d)

- Explain the pathophysiology of hollow organ injuries
- Describe assessment findings associated with hollow organ injuries
- Describe the treatment plan and management of hollow organ injuries

Learning Objectives (Cont’d)

- Describe the epidemiology, including morbidity, mortality rates, and prevention strategies, for solid organ injuries
- Explain the pathophysiology of solid organ injuries
- Describe assessment findings associated with solid organ injuries

Learning Objectives (Cont’d)

- Describe the treatment plan and management of solid organ injuries
- Describe the epidemiology, including morbidity, mortality rates, and prevention strategies, for abdominal vascular injuries
- Explain the pathophysiology of abdominal vascular injuries
Learning Objectives (Cont'd)

- Describe the assessment findings associated with abdominal vascular injuries
- Describe the treatment plan and management of patients with abdominal vascular injuries
- Describe the epidemiology, including morbidity, mortality rates, and prevention strategies, for pelvic fractures

Learning Objectives (Cont'd)

- Explain the pathophysiology of pelvic fractures
- Describe assessment findings associated with pelvic fractures
- Describe the treatment plan and management of pelvic fractures

Learning Objectives (Cont'd)

- Describe the epidemiology, including morbidity, mortality rates, and prevention strategies, for other related abdominal injuries
- Explain the pathophysiology of other related abdominal injuries
- Describe assessment findings associated with other related abdominal injuries
Learning Objectives (Cont'd)

- Describe the treatment plan and management of other related abdominal injuries
- Describe the epidemiology, including morbidity, mortality rates, and prevention strategies, for diaphragmatic injuries
- Explain the pathophysiology of diaphragmatic injuries

Learning Objectives (Cont'd)

- Describe the pathophysiology of aortic rupture
- Discuss the pathophysiology of vascular injuries, including injuries to:
  - Aorta
  - Venae cavae
  - Pulmonary arteries and veins
- Discuss assessment findings associated with vascular injuries

Learning Objectives (Cont'd)

- Discuss the management of vascular injuries
- Identify the need for rapid intervention and transport of the patient with vascular injuries
- Discuss the pathophysiology of diaphragmatic injuries
Learning Objectives (Cont'd)

- Discuss assessment findings associated with diaphragmatic injuries
- Discuss the management of diaphragmatic injuries
- Identify the need for rapid intervention and transport of the patient with diaphragmatic injuries

Learning Objectives (Cont'd)

- Describe assessment findings associated with diaphragmatic injuries
- Describe the treatment plan and management of diaphragmatic injuries
- Describe the epidemiology, including morbidity, mortality rates, and prevention strategies, for retroperitoneal injuries

Learning Objectives (Cont'd)

- Explain the pathophysiology of retroperitoneal injuries
- Describe assessment findings associated with retroperitoneal injuries
- Describe the treatment plan and management of patients with retroperitoneal injuries
Learning Objectives (Cont'd)

● Describe the epidemiology, including morbidity, mortality rates, and prevention strategies, for penetrating abdominal injuries
● Explain the pathophysiology of penetrating abdominal injuries
● Describe the assessment findings associated with penetrating abdominal injuries

Learning Objectives (Cont'd)

● Describe the treatment plan and management of patients with penetrating abdominal injuries
● Describe the epidemiology, including morbidity, mortality rates, and prevention strategies, for trauma in pregnancy
● Explain the pathophysiology of trauma in pregnancy

Learning Objectives (Cont'd)

● Describe the assessment findings associated with trauma in pregnancy
● Describe the treatment plan and management of the pregnant patient with trauma
● Describe the epidemiology, including morbidity, mortality rates, and prevention strategies, for genitourinary trauma
Learning Objectives (Cont'd)

- Explain the pathophysiology of genitourinary trauma
- Describe the assessment findings associated with genitourinary trauma
- Describe the treatment plan and management of genitourinary trauma

Introduction

- Blunt abdominal trauma, two-thirds of all trauma
- Hemorrhage control

Introduction (Cont'd)

- Solid organ
  - Liver
  - Spleen
  - Pancreas
  - Kidneys
  - Adrenal glands
  - Ovaries
Introduction (Cont’d)

- Hollow organs
  - Stomach
  - Intestines
  - Gallbladder
  - Urinary bladder
  - Uterus
- Vascular structure

Anatomy and Physiology

- Boundaries
  - Superiorly by diaphragm
  - Inferiorly by skeletal structures
  - Pelvis supporting ligaments
  - Vertebrae column posteriorly
  - Anterior abdominal wall
  - Abdomen, flank muscles laterally
Anatomy and Physiology (Cont’d)

- Quadrants
  - Right upper (RUQ)
    - Liver
    - Gallbladder
    - Part of stomach
    - Right kidney
    - Ascending colon
    - Transverse colon
    - Major blood vessels

Anatomy and Physiology (Cont’d)

- Quadrants
  - Left upper (LUQ)
    - Stomach
    - Spleen
    - Pancreas
    - Transverse colon
    - Descending colon
    - Left kidney

Anatomy and Physiology (Cont’d)

- Quadrants
  - Right lower (RLQ)
    - Appendix
    - Ascending colon
    - Right ovary
    - Right fallopian tube
Anatomy and Physiology (Cont’d)

- Quadrants
  - Left lower (LLQ)
    - Descending colon
    - Sigmoid colon
    - Left ovary
    - Left fallopian tube

- Retroperitoneal structures
  - Parts of duodenum, pancreas
  - Kidneys
  - Ureters
  - Parts of colon
  - Several vascular structures
  - Pelvic structures
    - Rectum
    - Ureters
    - Reproductive organs
    - Associated nerves, blood vessels
Anatomy and Physiology (Cont’d)

• Open injuries
  ➢ Abdominal contents exposed to outside environment
  ➢ Penetrating
  ➢ Blunt

Anatomy and Physiology (Cont’d)

• Closed injuries
  ➢ No contents exposed
  ➢ Blunt
  ➢ Hemorrhage possible without peritonitis
  ➢ Spillage of hollow organ contents
• Index of suspicion
  ➢ Anticipation of potential injuries on basis of primary complaint, mechanism of injury, assessment findings
Mechanisms of Abdominal Injury

- **Blunt trauma**
  - Compression forces
    - Anterior portion of abdomen ceases forward motion
    - Internal organs continue moving forward
  - Shear, deceleration forces
    - Part of internal structure fixed, part mobile

Mechanisms of Abdominal Injury (Cont'd)

- **Impact injuries**
  - Head-on, frontal
    - Pushed down under dashboard
    - Thrown forward, through windshield
    - Traumatic aortic disruptions, liver/spleen injuries, nonabdominal injuries

Mechanisms of Abdominal Injury (Cont'd)

- **Impact injuries**
  - Rear-impact collision
    - Cervical spine
    - Compression, deceleration injuries
Mechanisms of Abdominal Injury (Cont'd)

- Impact injuries
  - Lateral collision
    - Diaphragm
    - Liver, spleen
    - Pelvis
    - Rotational forces

- Seatbelt use
  - Prevents ejection
  - Prevents steering wheel injuries
    - Upper anterior abdominal
    - Anterior thoracic
  - Typical injury pattern
    - Pancreas
    - Liver
    - Spleen
    - Small bowel
    - Kidneys

- Secondary injuries
  - Motorcycle
  - Bicycle

- Pedestrian injuries
  - Injury pattern/phases
    - Car’s bumper hits victim
    - Head, abdominal, torso as victim is thrown
    - Victim hits ground
Mechanisms of Abdominal Injury (Cont’d)

- Falls
- Deceleration injuries
  - Penetrating injuries
  - Abdominal area involved
  - Amount of energy transferred
- Gunshot wounds
  - Kinetic energy = \( \frac{1}{2}M \times V^2 \)
  - \( M \) = mass
  - \( V \) = velocity

Assessment

- Critical findings
  - Altered mental status
  - Airway compromise
  - Respiratory distress
  - Shock
  - Signs of peritonitis

Assessment (Cont’d)

- Treat immediate life threats
- Rapid transport (“load and go”)
- Conduct further assessment en route
Assessment (Cont’d)

- Must conduct overall assessment
  - 1+ injury
  - Not immediately apparent
  - Injury changes over time

Assessment (Cont’d)

- Comprehensive assessment
  - En route
  - Vital signs
  - Inspection
  - Distention
  - External blood loss
  - Wounds
  - Eviscerations
  - Impaled objects
  - Inspect back

Assessment (Cont’d)

- Comprehensive assessment
  - Percussion
    - Hyperextend middle finger of one hand, place distal interphalangeal joint firmly against patient’s abdomen
    - With end of opposite middle finger, use quick flick of wrist to strike first finger
    - Categorize sound as normal, dull, hyperresonant
    - Practice until normal sound is heard
Assessment (Cont’d)

- Comprehensive assessment
  - Palpation
  - Tenderness, guarding
  - Extraabdominal structures

Management

- Surgical intervention
- No definitive therapy in field
- Bleeding continues
  - Rapid evaluation, evacuation
Management (Cont'd)

- Follow local protocols for transport
- En route
  - ABCs
  - Begin shock resuscitation immediately, continue
  - IV therapy
  - PASG per medical direction

Specific Abdominal Injuries

- Hollow organ injuries
  - Duodenal rupture
  - Unrestrained, head-on
  - Direct blow to abdomen
  - Blood loss
  - Intraluminal content spillage into peritoneum
  - Small, large intestines most frequently injured from penetrating, blunt trauma

Specific Abdominal Injuries (Cont'd)

- Hollow organ injuries
  - Stomach, mostly from blunt trauma
  - ABCs
  - Shock
  - Distention, guarding, rigidity
  - Rapid transport
Specific Abdominal Injuries (Cont'd)

- Solid organ injuries
  - Blunt/penetrating trauma
  - Hemorrhagic shock from blood loss
  - Liver injuries
  - Kehr's sign

Specific Abdominal Injuries (Cont'd)

- Solid organ injuries
  - Critical findings
    - Distended, rigid abdomen
    - Guarding on palpation
  - Secondary survey noncritical findings
    - Abnormal vital signs
    - Abnormalities on inspection, percussion, palpation
  - ABCs
  - Circulatory support
  - Rapid transport

Specific Abdominal Injuries (Cont'd)

- Vascular injuries
  - MVCs
    - Improperly worn seatbelt
  - Hemorrhagic shock
    - Find, assess signs on initial assessment, focused history, physical examination
  - If no findings, more detailed assessment
Specific Abdominal Injuries (Cont'd)

- Pelvic fractures
  - Auto/pedestrian collisions, MVCs, motorcycle crashes
  - Intraabdominal structures
  - Retroperitoneal structures
  - Blood vessels
  - Thoracic aorta tears

Specific Abdominal Injuries (Cont'd)

- Pelvic fractures
  - Hemorrhagic shock
    - Blood loss from bone
    - Pelvic veins, arteries
    - Associated injuries
    - Standard assessment
    - Palpate pelvis
    - ABCs
    - IV therapy
    - Stabilize bony injury
    - PASG per medical direction

Specific Abdominal Injuries (Cont'd)

- Abdominal wall injuries
  - Blunt/penetrating trauma
  - Indicate more severe injury
  - Contusion may indicate hemorrhagic shock
  - Assume penetration of peritoneum
  - Rapid transport
  - Treatment for shock
  - Evisceration
Specific Abdominal Injuries (Cont'd)

- Diaphragmatic injuries
  - Respiration
  - Blunt trauma
  - Hemiation of abdominal contents upward into chest cavity
  - Left hemidiaphragm most frequently injured
  - Supplemental O₂ ventilation
  - Transport

Specific Abdominal Injuries (Cont'd)

- Retroperitoneal injuries
  - Parts of duodenum, aorta, kidneys, pancreas
  - Pancreatic injury
    - Producing enzymes released into peritoneum
    - Break down organs, tissues
    - Findings
    - ABC's
    - Resuscitation from shock
Specific Abdominal Injuries
(Cont'd)

- Penetrating injuries
  - 1+ wounds typical
  - Describe by size, location
  - ABCs
  - Stabilize impaled object
  - Hemorrhagic shock treatment

Specific Abdominal Injuries
(Cont'd)

- Trauma in pregnancy
  - Abruptio placentae
    - Placenta separates from uterine wall after week 20 of gestation
    - Signs
      - Abdominal pain, cramping
      - Uterine pain
      - Uterine tenderness
      - Uterine contractions
      - Vaginal bleeding
  - ABCs
  - Hemorrhagic shock treatment
  - Transport on left side

Specific Abdominal Injuries
(Cont'd)

- Trauma in pregnancy
  - Abruptio placentae
    - ABCs
    - Hemorrhagic shock treatment
    - Transport on left side
  - Premature labor
    - Fall, MVC, other blunt trauma
    - ABCs
    - Treatment of shock
  - Uterine rupture
    - Improper seatbelt position

- Trauma in pregnancy
  - Abruptio placentae
    - ABCs
    - Hemorrhagic shock treatment
    - Transport on left side
  - Premature labor
    - Fall, MVC, other blunt trauma
    - ABCs
    - Treatment of shock
  - Uterine rupture
    - Improper seatbelt position

- Trauma in pregnancy
  - Abruptio placentae
    - ABCs
    - Hemorrhagic shock treatment
    - Transport on left side
  - Premature labor
    - Fall, MVC, other blunt trauma
    - ABCs
    - Treatment of shock
  - Uterine rupture
    - Improper seatbelt position

- Trauma in pregnancy
  - Abruptio placentae
    - ABCs
    - Hemorrhagic shock treatment
    - Transport on left side
  - Premature labor
    - Fall, MVC, other blunt trauma
    - ABCs
    - Treatment of shock
  - Uterine rupture
    - Improper seatbelt position
Specific Abdominal Injuries (Cont'd)

- Genitourinary trauma
  - Bladder
    - Lower abdominal, pelvic injuries
    - Rupture into abdominal/pelvic cavity

Specific Abdominal Injuries (Cont'd)

- Genitourinary trauma
  - External genitalia
    - Burned, lacerated penetrated, contused
    - Rarely life-threatening
    - Do not distract from primary, secondary survey
    - Internal injury signs, blood at urethral meatus of male
    - Control hemorrhage with direct pressure
    - ABCs
    - Treatment of shock

Specific Abdominal Injuries (Cont'd)

- Genitourinary trauma
  - Kidneys and ureters
    - Direct trauma to back, flank
    - Contusions, hematomas, collecting system disruption
    - Ecchymosis at injury site
    - Blood in urine
    - ABCs
    - Treatment of shock
Chapter Summary

- Morbidity and mortality from abdominal trauma primarily related to hemorrhage
- Goal of prehospital care for abdominal trauma is prevent and control of hemorrhage when possible; rapidly transport the patient to a facility capable of surgical intervention when necessary

Chapter Summary (Cont'd)

- Abdominal trauma may involve solid organs, hollow organs, and vascular structures in any combination
- Spillage of abdominal contents from rupture of hollow organs leads to peritonitis, the second leading cause of morbidity and mortality

Chapter Summary (Cont'd)

- Maintain a high index of suspicion in the assessment of patients with potential abdominal injuries
- Assessment of the patient with abdominal trauma should proceed in staged fashion, beginning with the search for critical findings
Chapter Summary (Cont’d)

- Rapidly transport patients with critical findings on primary survey to an appropriate receiving facility
- For victims with significant abdominal trauma, conduct further assessment; initial treatment for shock while en route to the hospital

Questions?