Objectives

- Describe mechanisms of injury, signs and symptoms, and complications associated with injuries of:
  - Abdominal solid organs
  - Hollow organs
  - Retroperitoneal organs
  - Pelvic organs

Objectives

- Outline the significance of injury to intraabdominal vascular structures

- Describe assessment priorities for the patient suspected to have abdominal injury

- Outline the prehospital care of the patient with abdominal trauma
Scenario

The size-up from the first unit on the scene said, "One vehicle into a tree, major damage." Your patient, an unrestrained male, is still seated in the front of an old pick-up truck, behind the severely bent steering wheel. He is pale, anxious and confused, and has a small head wound. You can’t feel a radial pulse, but his carotid is fast and thready. His lungs are clear, but he moans when you touch the large reddened area over his upper abdomen. "Get a line set up," you shout to your partner as you apply a cervical collar and oxygen, and prepare for a rapid extrication. You can sense that time will be critical on this call.

Discussion

- Was the mechanism of injury on this call suspicious for abdominal injury?
- Which abdominal organs may be injured?
- What signs and symptoms lead you to believe that an abdominal injury is likely?
- What are your priorities of care for this man?

Abdominal Trauma

- Blunt or penetrating trauma
- MVC major cause of abdominal trauma
- Other
  - Blows to abdomen
  - Falls
Abdominal Trauma

- Difficult to evaluate due to:
  - Wide spectrum of potential injuries to multiple organs
  - Physical findings sometimes lacking or exaggerated

Abdominal Trauma

- Assessment may be compromised by:
  - Alcohol and/or recreational drugs
  - Injury to brain, spinal cord
  - Injury to ribs, spine, pelvis

- High degree of suspicion based on mechanism of injury and kinematics

Boundaries of the Abdomen

- Diaphragm
- Anterior abdominal wall
- Pelvic bones
- Vertebral column
- Muscles of the abdomen and flanks
Surface Anatomy of the Abdomen

- Quadrants
  - Upper—right, left
  - Lower—right, left
- Xiphoid
- Symphysis pubis
- Umbilicus

Peritoneal Cavity

- “True” abdominal cavity
- Quadrants
  - Upper—right, left
  - Lower—right, left
- Liver, spleen, stomach, small intestine, colon, gallbladder, female reproductive organs

Pelvic Cavity

- Surrounded by pelvic bones
- Lower part of retroperitoneal space
- Contents
  - Rectum
  - Bladder
  - Urethra
  - Iliac vessels
  - In women, internal genitalia
Retroperitoneal Space

- Potential space
- Behind "true" abdominal cavity
- Contents
  - Abdominal aorta
  - Inferior vena cava
  - Most of duodenum
  - Pancreas
  - Kidneys
  - Ureters
  - Ascending and descending colon

Mechanisms of Abdominal Injury

- Blunt trauma
  - Compression or crushing forces
  - Shearing forces
  - Deceleration forces

Mechanisms of Abdominal Injury

- Degree of injury related to:
  - Quantity and duration of force
  - Abdominal structure injured
    - Fluid filled
    - Gas filled
    - Solid
    - Hollow

Blunt Trauma

- Motor vehicle collisions
- Motorcycle collisions
- Pedestrian injuries
- Falls
- Assault
- Blast injuries

Penetrating Trauma

- Energy imparted to body
  - Low velocity: Knife, ice pick
  - Medium velocity: Gunshot wounds, shotgun wounds
  - High velocity: High-power hunting rifles, military weapons
- Ballistics
- Trajectory
- Distance

Solid and Hollow Organs

- Solid organs
  - Liver
  - Spleen
  - Pancreas
  - Kidneys
  - Adrenals
  - Ovaries (female)
- Hollow organs
  - Stomach
  - Intestines
  - Gallbladder
  - Urinary bladder
  - Uterus (female)
Liver

- Largest organ in abdominal cavity
- Right upper quadrant
- Injured from trauma to:
  - Eighth through twelfth ribs on right side of body
  - Upper central part of abdomen
Liver

- Suspect liver injury when:
  - Steering wheel injury
  - Lap belt injury
  - Epigastric trauma
- After injury, blood and bile leak into peritoneal cavity
  - Shock
  - Peritoneal irritation

Spleen

- Upper left quadrant
- Rich blood supply
- Slightly protected by organs surrounding it and by lower rib cage
  - Most commonly injured organ from blunt trauma
  - Associated intraabdominal injuries common

Spleen

- Suspect splenic injury in:
  - Motor vehicle crashes
  - Falls or sports injuries involving an impact to the lower left chest, flank, or upper left abdomen
- Kehr’s sign
  - Left upper quadrant pain radiates to left shoulder
  - Common complaint with splenic injury
**Stomach**
- Not commonly injured by blunt trauma
- Protected location in abdomen
- Penetrating trauma may cause gastric transection or laceration
  - Signs of peritonitis from leakage of gastric contents
- Diagnosis confirmed during surgery
  - Unless nasogastric drainage returns blood

**Colon and Small Intestine**
- Usually injured by penetrating trauma
- May be injured by compression forces:
  - High-speed motor vehicle crashes
  - Deceleration injuries associated with wearing personal restraints
- Bacterial contamination common

**Retroperitoneal Organ Injury**
- Blunt or penetrating trauma to:
  - Anterior abdomen
  - Posterior abdomen
    - Particularly flank
  - Thoracic spine
Kidneys
- High on posterior wall of abdominal cavity in retroperitoneal space
  - Held in place by renal fascia
  - Cushioned by layer of adipose tissue
  - Partially protected by lower rib cage

Injuries may involve fracture and laceration
- Resulting in hemorrhage, urine extravasation, or both
- Contusions usually self-limiting
  - Heal with bed rest and forced fluids
- Fractures and lacerations may need surgical repair

Ureters
- Hollow organs
- Rarely injured in blunt trauma
  - Flexible structure
- Injury from penetrating abdominal or flank wounds (stab wounds, firearm injuries)
Pancreas

- Solid organ in peritoneal space
- Blunt injury usually from crushing injury between spine and a steering wheel, handlebar, or blunt weapon
- Most pancreatic injuries are due to penetrating trauma

Duodenum

- Lies across lumbar spine
- Seldom injured due to location in retroperitoneal area, near pancreas
- May be crushed or lacerated when great force of blunt trauma or penetrating injury occurs
  - Usually associated with pancreatic trauma

Pelvic Organ Injury

- Usually from motor vehicle crashes that produce pelvic fractures
- Less frequent causes
  - Penetrating trauma
  - Straddle-type injuries from falls
  - Pedestrian accidents
  - Some sexual acts
**Urinary Bladder**

- Hollow organ
- Ruptured by blunt or penetrating trauma or pelvic fracture
  - Rupture more likely if bladder is distended at time of injury
- Suspect bladder injury in inebriated patients subjected to lower abdominal trauma

**Vascular Structure Injury**

- Intraabdominal arterial and venous injuries may be life threatening
- Usually occur from penetrating trauma
- Also from compression or deceleration forces applied to abdomen
- Often presents as hypovolemia
- May be a palpable abdominal mass

**Vascular Structure Injury**

- Major vessels most frequently injured:
  - Aorta
  - Inferior vena cava
  - Renal, mesentric, and iliac arteries and veins
Pelvic Fractures

- Disruption of pelvis from:
  - Motorcycle crashes
  - Pedestrian-vehicle collisions
  - Direct crushing injury to pelvis
  - Falls from heights greater than 12 feet

- Blunt or penetrating injury may result in:
  - Fracture
  - Severe hemorrhage
  - Associated injury to urinary bladder and urethra

Suspicion of pelvic injury should be based on:

- Mechanism of injury
- Presence of tenderness on palpation of iliac crests

Direct or indirect force

Assessment findings

Management

Evisceration

- Protrusion of internal organ through wound
  - Common with stab wounds
- Do not replace organs into abdomen
  - Protect from damage
  - Cover with sterile saline dressing
Focused History and Physical

- Head injury, drugs, alcohol mask signs and symptoms
- Hemoperitoneum (solid organ/vascular injuries)
  - Adult abdomen holds 1.5 L with no distention
  - May have normal abdominal exam
  - Unexplained shock
    - Shock out of proportion to known injuries

Peritonitis—Signs and Symptoms

- Pain (subjective symptom from patient)
- Tenderness (objective sign with percussion/palpation)
- Guarding/rigidity
- Distention (late finding)
- Abrasions
- Ecchymosis
- Visible wounds
- Mechanism of injury
- Unexplained shock

Critical Findings

- Rapid assessment and transport
- Detailed assessment
- Ongoing assessment
Noncritical Findings

- Focused history and physical examination
- Other interventions and transport considerations

Comprehensive Assessment

- Vital signs
- Inspection
- Auscultation
- Percussion
- Palpation

Absence of signs and symptoms does not rule out abdominal injuries

Remember to examine the back

Differential diagnosis

Continued management
Management/Treatment Plan

- Surgical intervention only effective therapy
- Rapid evaluation
- Shock resuscitation
- Rapid packaging and transport to nearest appropriate facility
  > Facility must have immediate surgical capability
- Crystalloid fluid en route (per protocol)

Indications for Rapid Transport

- Critical findings
  > Surgical intervention required to control hemorrhage and/or contamination
  > High index of suspicion for abdominal injury
  > Unexplained shock
  > Physical signs of abdominal injury

- Hemorrhage

  > Survival related to time from injury to surgical control of hemorrhage
  > Any delay in the field negatively affects this time period
Conclusion
Abdominal trauma is often difficult to evaluate in the prehospital setting. Therefore the paramedic must exercise a high degree of suspicion based on the mechanism of injury and kinematics. Death from abdominal injury usually results from hemorrhage and delayed surgical repair.