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Abdominal and Pelvic Trauma

Advanced Care Paramedicine

Module: 08
Section: 09

Abdominal Trauma

- May be difficult to evaluate in the prehospital setting due to:
  - Wide spectrum of potential injuries to multiple organs
  - Physical findings that are sometimes lacking or exaggerated

Abdominal Trauma

- Assessment may be compromised by:
  - Use of alcohol and/or recreational drugs
  - Injury to brain, spinal cord
  - Injury to ribs, spine, pelvis
- Exercise a 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

Peritoneal Cavity

- Also called the “true” abdominal cavity
- Quadrants
  - Upper - right, left
  - Lower - right, left
- Contents-liver, spleen, stomach, small intestine, colon, gallbladder, female reproductive organs

Pelvic Cavity

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

Retroperitoneal Space

- Potential space behind the “true” abdominal cavity
- Contents (ADUCKPIE):
  - Abdominal aorta
  - Duodenum
  - Ureter
  - Colon
  - Kidneys
  - Pancreas
  - Inferior vena cava
  - Esophagus

Blunt Trauma

- Produces least visible signs of injury
- Most frequently involves spleen and liver
- Causes
  - Deceleration
    - Contents damaged by change in velocity
  - Compression
    - Organs trapped between other structures
  - Shear
    - Part of an organ is able to move while another part is fixed
    - i.e.: *Ligamentum teres*
- Degree of injury is usually related to:
  - Quantity and duration of force applied
  - Type of abdominal structure injured (fluid filled, gas filled, solid, hollow)

FIGURE 26–2 Blunt trauma to the left lower quadrant.

Penetrating Trauma

- Energy transmitted to surrounding tissue
- Projectile cavitation, pitch & yaw
- Most frequently involves liver and small bowel
- Consequences
  - Uncontrolled hemorrhage
  - Organ damage
  - Spillage of hollow organ contents
  - Irritation & Inflammation of abdominal lining
- Shotgun Trauma
  - Multiple projectiles

FIGURE 26-1 Stab wound to the right upper quadrant.

Blast Injuries

- Blunt and penetrating mechanisms
- Irregular shaped shrapnel and debris
- Pressure wave
  - Compresses and relaxes air-filled organs
  - Contuse or rupture organs
- Abdominal injury is secondary concern during blast injury

Injury to the Abdominal Wall

- Skin and muscles transmit blunt trauma to internal structures
  - Typically only show erythema
  - Visible swelling and ecchymosis occur over several hours
- Penetrating trauma may appear minimal externally in comparison to internal trauma
  - Muscle may mask the size of the external wound
  - Evisceration may be present
- Trauma to thorax, buttocks, flanks and back may penetrate abdomen
- Diaphragmatic tears
  - Herniation of abdominal contents into thorax

Solid & Hollow Organs

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

Manifestations of Blood Loss

- Hematochezia
  - Bright red blood in stool
- Melena
  - Stool with blood that has been altered by the gut flora and appears black/"tarry"
- Hematemesis
  - Blood in emesis
- Hematuria
  - Blood in the urine

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Solid Organ Injury

Injury to the Solid Organs

- Dense and less strongly held together
- Prone to contusion
  - Bleeding
  - Fracture (rupture)
- Unrestricted hemorrhage if organ capsule is ruptured
- Specific Organs
  - Spleen: pain referred to left shoulder
  - Liver: pain referred to the right shoulder

Liver

- Largest organ in the abdominal cavity
- Located in the right upper quadrant of abdomen
- Commonly injured from trauma to the:
  - Eighth through twelfth ribs on right side of body
  - Upper central part of abdomen

Liver

- Suspect liver injury in any patient with:
  - Steering wheel injury
  - Lap belt injury
  - History of epigastric trauma
- After injury, blood and bile escape into peritoneal cavity
  - Produces signs and symptoms of shock and peritoneal irritation, respectively

Spleen

- Lies in upper left quadrant of abdomen
- Rich blood supply
- Slightly protected by organs surrounding it medially and anteriorly and by lower portion of rib cage
  - Most commonly injured organ from blunt trauma
  - Associated intraabdominal injuries common

Spleen

- Suspect splenic injury in:
  - Motor vehicle crashes
  - Falls or sport injuries in which there was an impact to lower left chest, flank, or upper left abdomen
- Kehr's sign
  - Left upper quadrant pain with radiation to left shoulder
  - Common complaint associated with splenic injury

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Hollow Organ Injury

Injury to Vascular Structures

- Intraabdominal arterial and venous injuries may be life-threatening
- Abdominal aorta and vena cava
  - Prone to direct blunt or penetrating trauma
  - May be injured in deceleration injuries
- Blood accumulates beneath diaphragm
  - Irritation of muscular structures
  - Produces referred pain in the shoulder region
  - Greater volume of blood can be lost
  - Presence of blood in abdomen, stimulates vagus nerve resulting in slowing of heart rate
- Blood can isolate in any of the abdominal spaces
  - Occasionally associated with a palpable abdominal mass

Stomach

- Not commonly injured after blunt trauma because of its protected location in abdomen
- Penetrating trauma may cause gastric transection or laceration
- Patients exhibit signs of peritonitis rapidly from leakage of gastric contents
- Diagnosis confirmed during surgery unless nasogastric drainage returns blood

Colon and Small Intestine

- Injury is usually the result of penetrating trauma
- Large and small intestine may also be injured by compression forces
  - High-speed motor vehicle crashes
  - Deceleration injuries associated with wearing personal restraints
- Bacterial contamination common problem with these injuries

Injury to Mesentery and Bowel

- Provides bowel with circulation, innervation, and attachment
- Disrupt blood vessels supplying the bowel
  - Lead to ischemia, necrosis, or rupture
- Blood loss minimal
  - Peritoneal layers contain hemorrhage
- Tear of mesentery may rupture bowel
- Penetrating trauma to the lateral abdomen likely to injure large bowel

Injury to the Peritoneum

- Delicate and sensitive lining of anterior abdomen
- Peritonitis
- Inflammation of the peritoneum
  - Bacterial irritation
    - Due to torn bowel or open wound
  - Chemical irritation
    - Caustic nature of digestive enzymes
    - Urine initiates inflammatory response
    - Blood does not induce peritonitis

Injury to the Peritoneum

- Progression
  - Slight tenderness at location of injury
  - Rebound tenderness
  - Guarding
  - Rigid, board-like feel

Retroperitoneal Organ Injury

Retroperitoneal Organ Injury

- May occur because of blunt or penetrating trauma to the:
  - Anterior abdomen
  - Posterior abdomen (particularly the flank area) or
  - Thoracic spine

Kidneys

- Located high on posterior wall of abdominal cavity in retroperitoneal space
  - Held in place by renal fascia
  - Cushioned by a generous layer of adipose tissue
  - Partially enclosed and protected by lower rib cage

Kidneys

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

Ureters

- Hollow organs
- Rarely injured in blunt trauma because of their flexible structure
- Injury usually occurs from penetrating abdominal or flank wounds (stab wounds, firearm injuries)

Pancreas

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

Duodenum

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

Pelvic Organ Injury

- Usually results 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
- May be 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

Pelvic Fractures

- Disruption of the pelvis may occur from:
  - Motorcycle crashes
  - Pedestrian-vehicle collisions
  - Direct crushing injury to the 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

Injury to the Pelvis

- Serious skeletal injury
  - Life threatening hemorrhage
  - Potential injury to pelvic organs
    - Ureters
    - Bladder
    - Urethra
    - Female Genitalia
    - Prostate
    - Rectum
    - Anus

Pelvic Fractures

- Suspicion of pelvic injury should be based on:
  - Mechanism of injury
  - Presence of tenderness on palpation of iliac crests
- Force may be direct or indirect
- Assessment findings
- Management

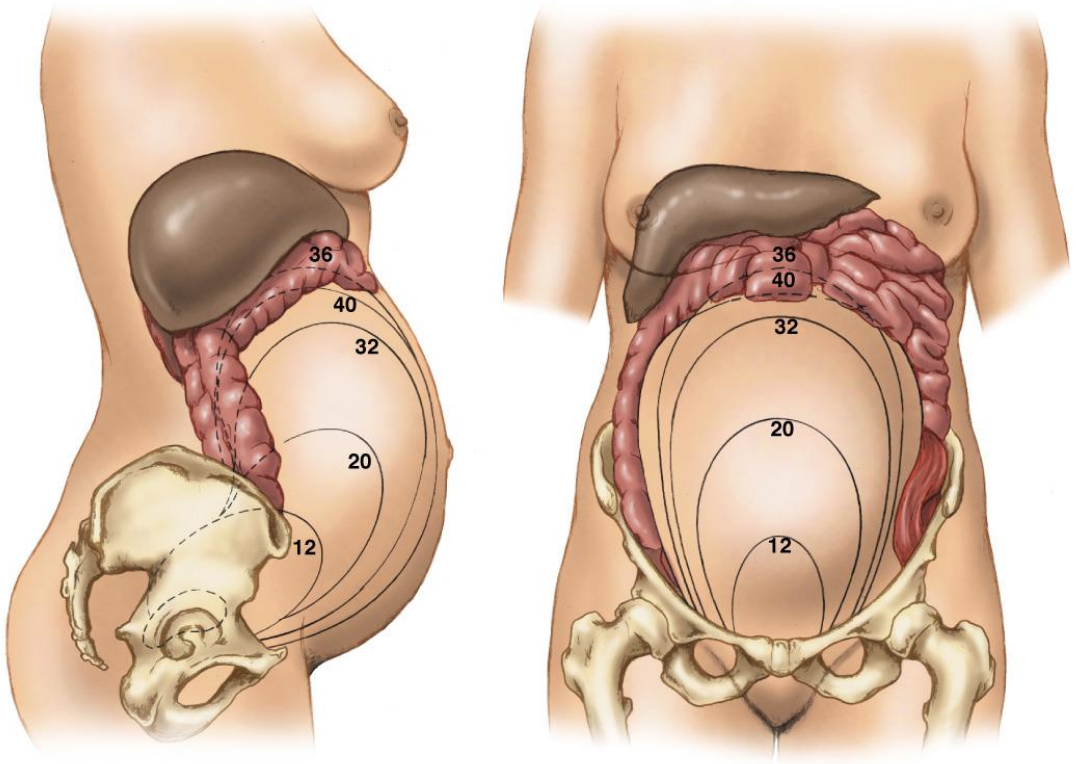
Evisceration

- Protrusion of an internal organ through a wound or surgical incision, especially in the abdominal wall
  - Common finding with stab wounds
  - May be seen to a lesser degree with gunshot wounds
- Do not replace organs back into abdomen
  - Protect organs from further damage
  - Cover with sterile saline moistened dressing
- Transport

Injury During Pregnancy

- Trauma is the number one killer of pregnant females
  - Penetrating abdominal trauma accounts for 36% of maternal mortality
    - GSW account for 40-70% of penetrating trauma
  - Blunt trauma due to improperly worn seatbelts
    - Auto collisions are leading cause of mortality
- Changing dimensions of uterus
  - Protects abdominal organs
  - Trauma endangers uterus and fetus

Changing dimensions of the pregnant uterus



Injury During Pregnancy

- Maternal Changes
  - Increasing size & weight of uterus
    - Compression of inferior vena cava
    - Reduce venous return to heart
  - Increasing maternal blood volume
    - Protect mother from hypovolemia
    - 30-35% of blood less necessary before signs of shock
  - Uterus is thick and muscular
    - Distributes forces of trauma uniformly to fetus
    - Reduces chances for injury

Injury During Pregnancy

- Risk of uterine and fetal injury
  - Increases with the length of gestation
  - Greatest risk during third trimester
- Penetrating trauma may cause fetal and maternal blood mixing
- Blunt trauma complications
  - Uterine rupture
  - Abruptio placenta
  - Premature rupture of amniotic sac

Abruptio placenta

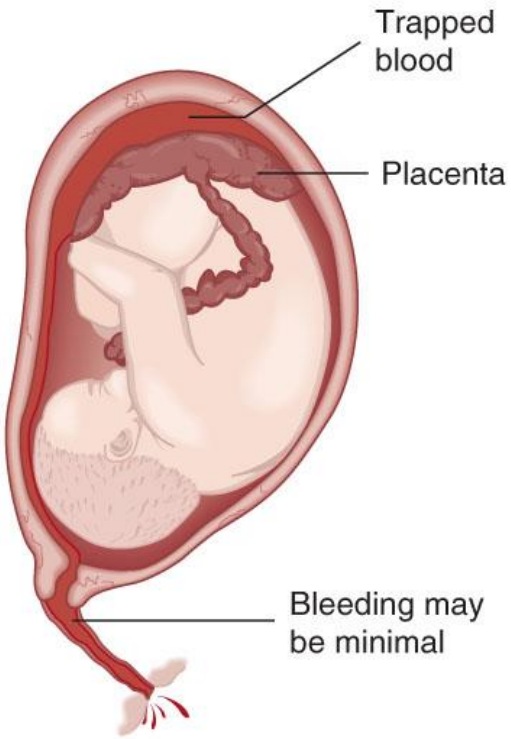


FIGURE 26-6 Abruptio placenta.

Assessment

- Scene assessment
  - Must evaluate MOI to assess seriousness of injury
  - Identify strength and direction of forces
    - Velocity of impact
    - Focus observations and palpation on that site
    - Develop a mental list of possible organs involved

FIGURE 26-7 Use the mechanism of injury to identify where signs of injury might be found—for example, contusions resulting from compression by a seat belt.

MVC Assessment

- Determine if seatbelts used properly
- Interior signs of impact
  - Steering wheel and dashboard deformity
- Frontal Impact
  - Compress abdomen
  - Liver, spleen, and rupture of hollow organs
- Right Impact
  - Liver, ascending colon, and pelvis
- Left Impact
  - Spleen, descending colon and pelvis

Assessment

- Scene assessment
  - Gunshot Wounds
    - Safety (patient and assailant)
    - Type and caliber of weapon
  - Internal damage does not correlate well with the appearance of entry/exit wounds

FIGURE 26-8 Analyze the mechanism of a penetrating trauma in an attempt to determine the probable angle and depth of the wound.

Rapid Trauma Assessment

- Closely examine regions with a high index of suspicion
- Expose and examine for DCAP-BTLS
  - If suspected pelvic injury do not test pelvis
  - Palpate entire abdomen
  - Evaluate for entrance and exit wounds
- OPQRST Assessment
  - Characteristics of pain
  - Tenderness versus rebound tenderness
- SAMPLE History
- Vital signs assessment

FIGURE 26-9 Examine the abdomen for signs of injury.

Focused History and Physical

- Head injury and/ or intoxicants (drugs/alcohol) mask signs and symptoms
- Hemoperitoneum (solid organ/vascular injuries)
  - Adult abdomen will accommodate 1.5 liters with no abdominal distention
    - Often present even with normal abdominal exam
  - Unexplained shock
    - Shock out of proportion to known injuries

Pregnant Patients Considerations

- Signs of shock
  - Pretreat: signs may not develop until 30% of blood volume is lost
  - Body begins shunting blood from GI/GU to primary organs
- Supine hypotensive syndrome
- Premature contractions
- Vaginal hemorrhage
  - Uterine rupture versus abruptio placenta
- Uterus development
  - Abnormal asymmetry

Peritonitis – Signs & 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

Comprehensive Assessment

- Absence of signs and symptoms does not rule out abdominal injuries
  - Not necessary to determine definitively if abdominal injuries are present
- Remember to examine the back
- Differential diagnosis
- Continued management

General Management

- Position Patient
  - Position of comfort unless spinal injury
  - Flex knees or left lateral recumbent
- Ensure oxygenation and ventilation
- Control external bleeding
- Be prepared for fluid resuscitation
- Specific injury care
  - Impaled objects
  - Eviscerations

Evisceration

Management of the Pregnant Patient

- Positioning
  - Left lateral recumbent
  - If on backboard tilt backboard
  - Facilitates venous return
- Oxygenation
  - High flow O2
  - Consider PPV by BVM if hypoxia ensues
- Maintain high index of suspicion for intra-abdominal bleeding

Management/Treatment Plan

- Surgical intervention only effective therapy
- Rapid evaluation
- Initiation of shock resuscitation
- Rapid packaging and transport to nearest appropriate facility
  - Facility must have immediate surgical capability
  - Rapid transport
    - Defeated if hospital cannot provide immediate surgical intervention
- Crystalloid fluid replacement en route to hospital

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

Indications for Rapid Transport

- Hemorrhage continues until controlled in Operating Room
- Survival determined by length of time from injury to definitive surgical control of hemorrhage
  - Any delay in the field negatively impacts this time period

Ongoing Assessment

- Trend vital signs
  - Every 5 minutes for critical patients
- Evaluation
  - Progressive peritonitis
  - Progressive hemorrhage
    - BP and capillary refill
    - Pulse rate and pulse oximetry
    - Mental status
    - Skin condition
    - Ineffective aggressive fluid resuscitation