SOCIETY OF TRAUMA NURSES

THE ELECTRONIC LIBRARY OF TRAUMA LECTURES

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TRAUMA LECTURES

Abdominal Trauma

SOCIETY OF TRAUMA NURSES

Objectives

At the conclusion of this presentation the participant will be able to:

- Describe common mechanisms of injury seen in abdominal trauma
- Discuss various injuries of the abdomen
- State appropriate assessment and diagnostic studies for the patient with abdominal trauma
- Describe abdominal compartment syndrome and the importance of early recognition

Epidemiology

Incidence

- Abdominal injuries rank among the top seven causes of death in trauma.
- Accounts for more than 10% of trauma deaths
- Seldom a single system injury

Mechanism of Injury

Blunt

Penetrating

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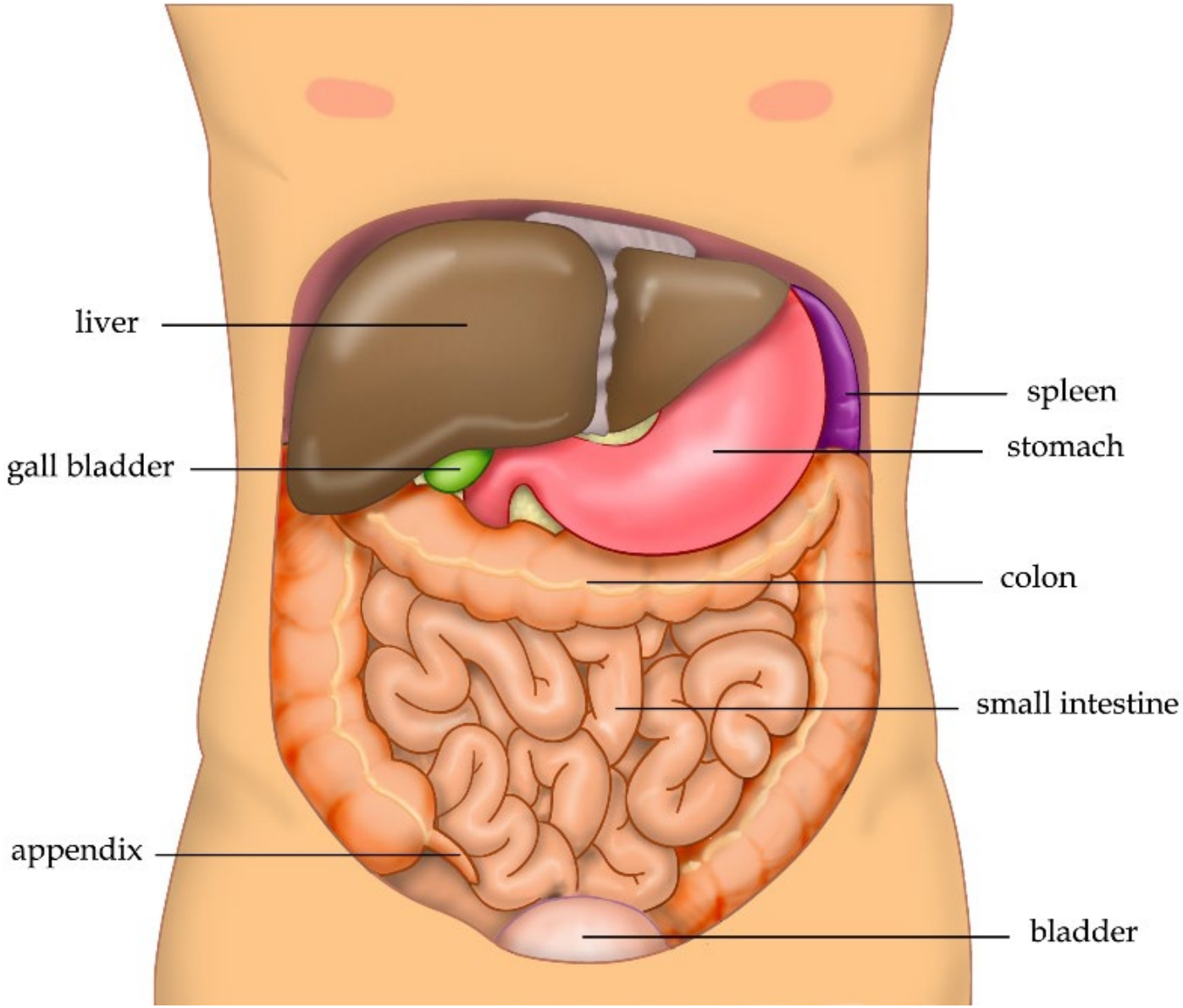
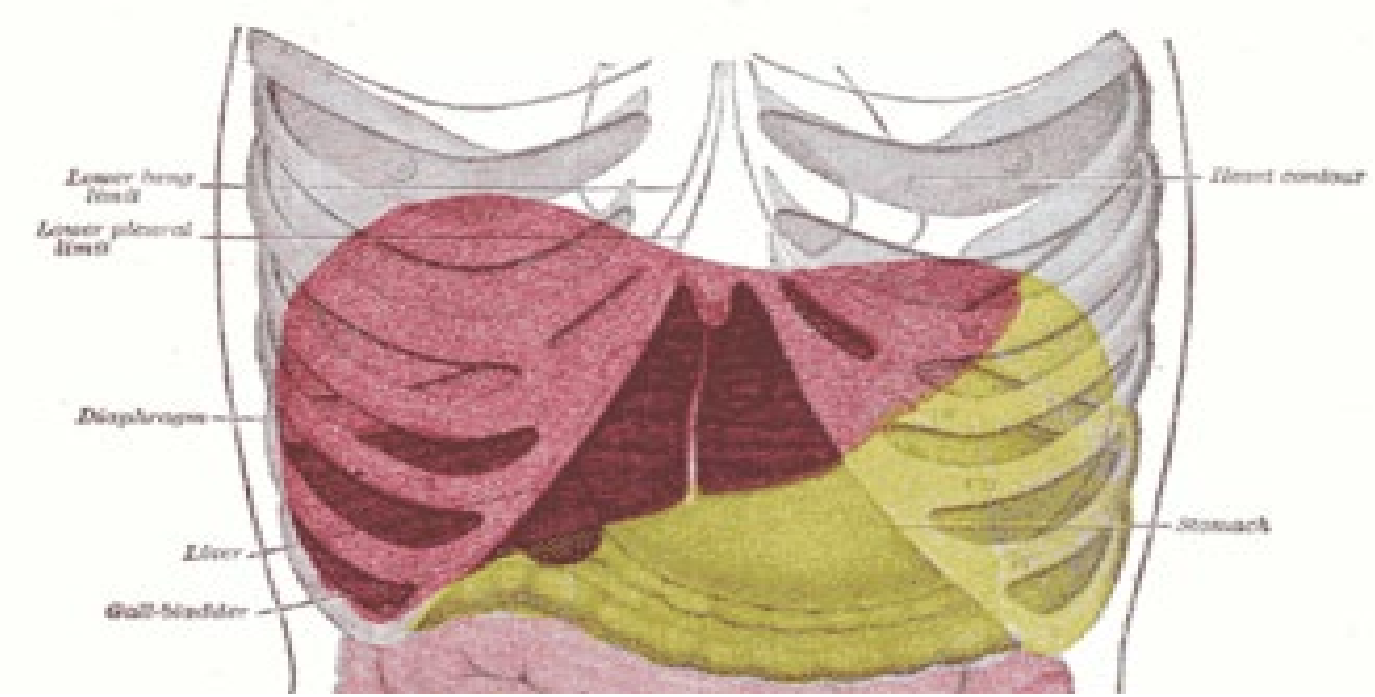
Mechanism of Injury

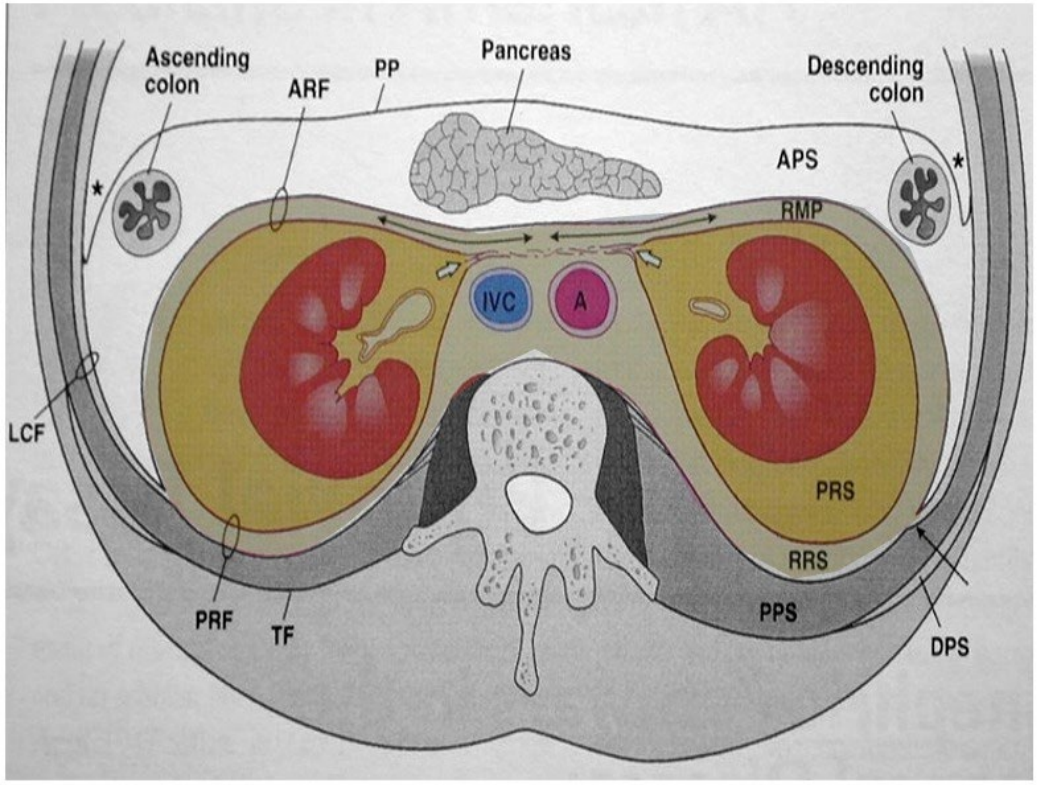
- Heightens suspicion for certain injuries
- Blunt injury and types of forces
- Use of restraint devices
- Penetrating trauma

Anatomy and Physiology



Abdominal Sections





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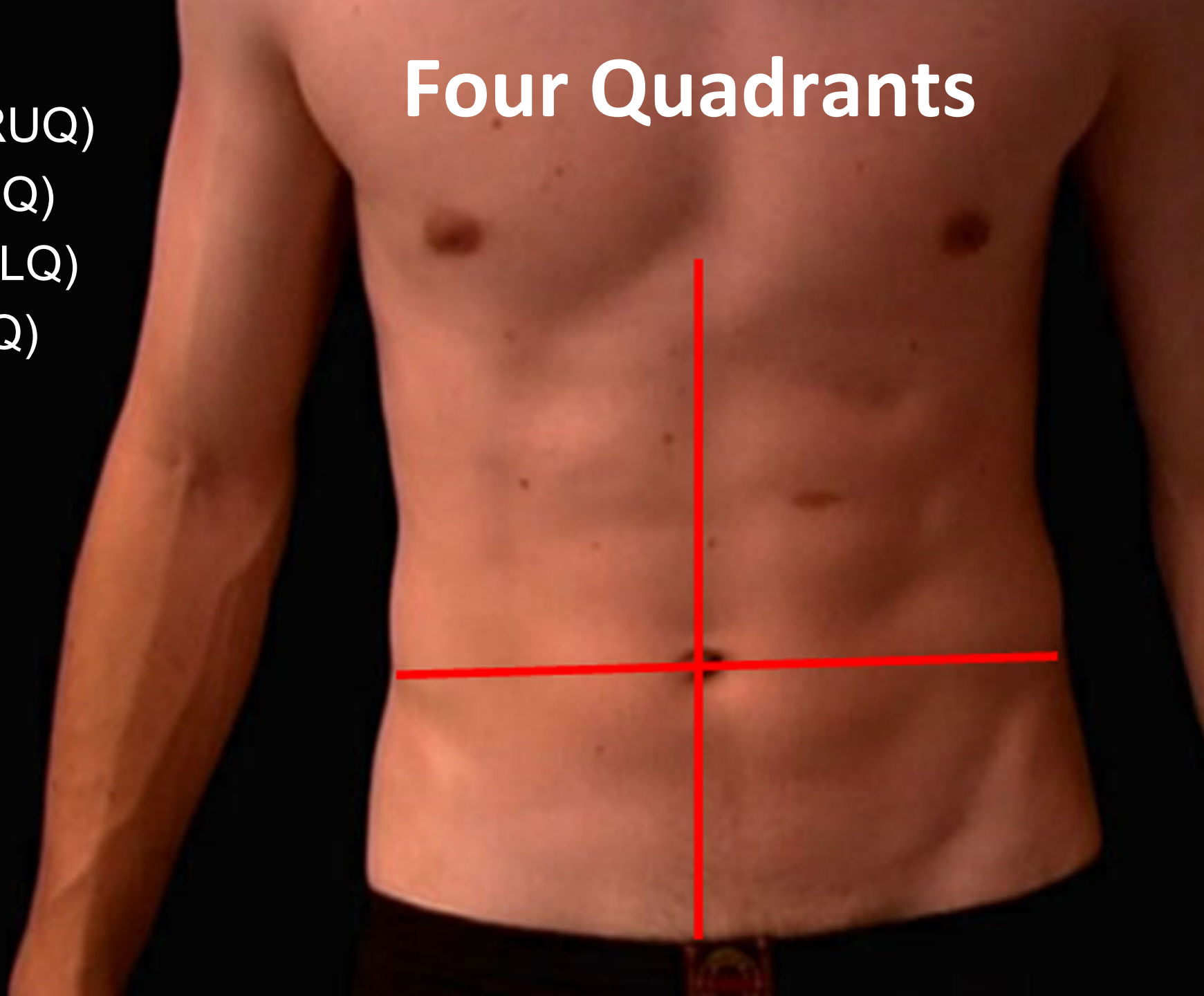
Abdominal Assessment

- Inspection
- Auscultation
- Percussion
- Palpation

Four Quadrants

Right upper quadrant (RUQ)
Left upper quadrant (LUQ)
Right lower quadrant (RLQ)
Left lower quadrant (LLQ)

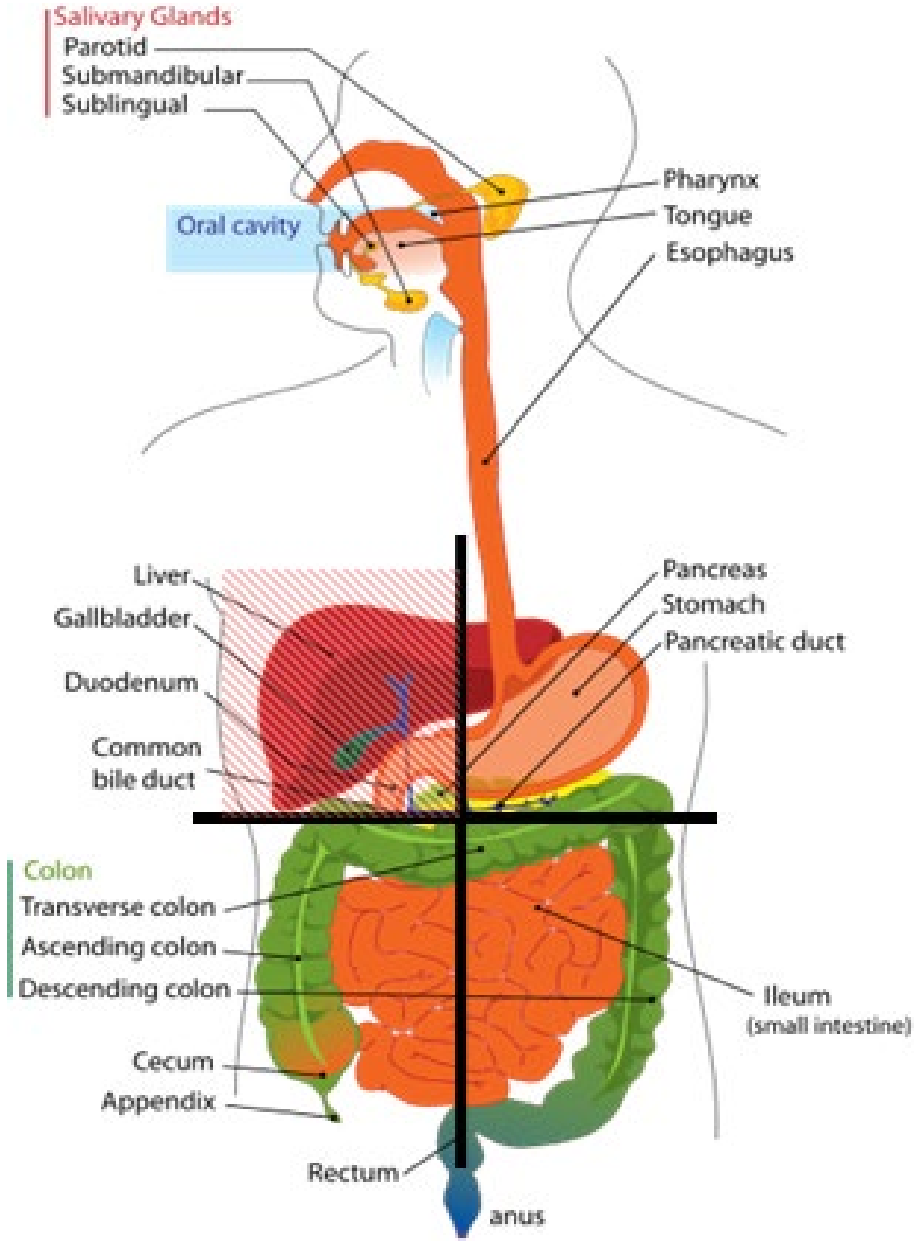


RUQ

- Liver
- Gallbladder with biliary tree
- Duodenum
- Head of pancreas
- Hepatic flexure of colon

LUQ

- Stomach
- Spleen
- Left lobe liver
- Left kidney
- Left adrenal gland
- Splenic flexure of colon
- Parts of transverse and descending colon



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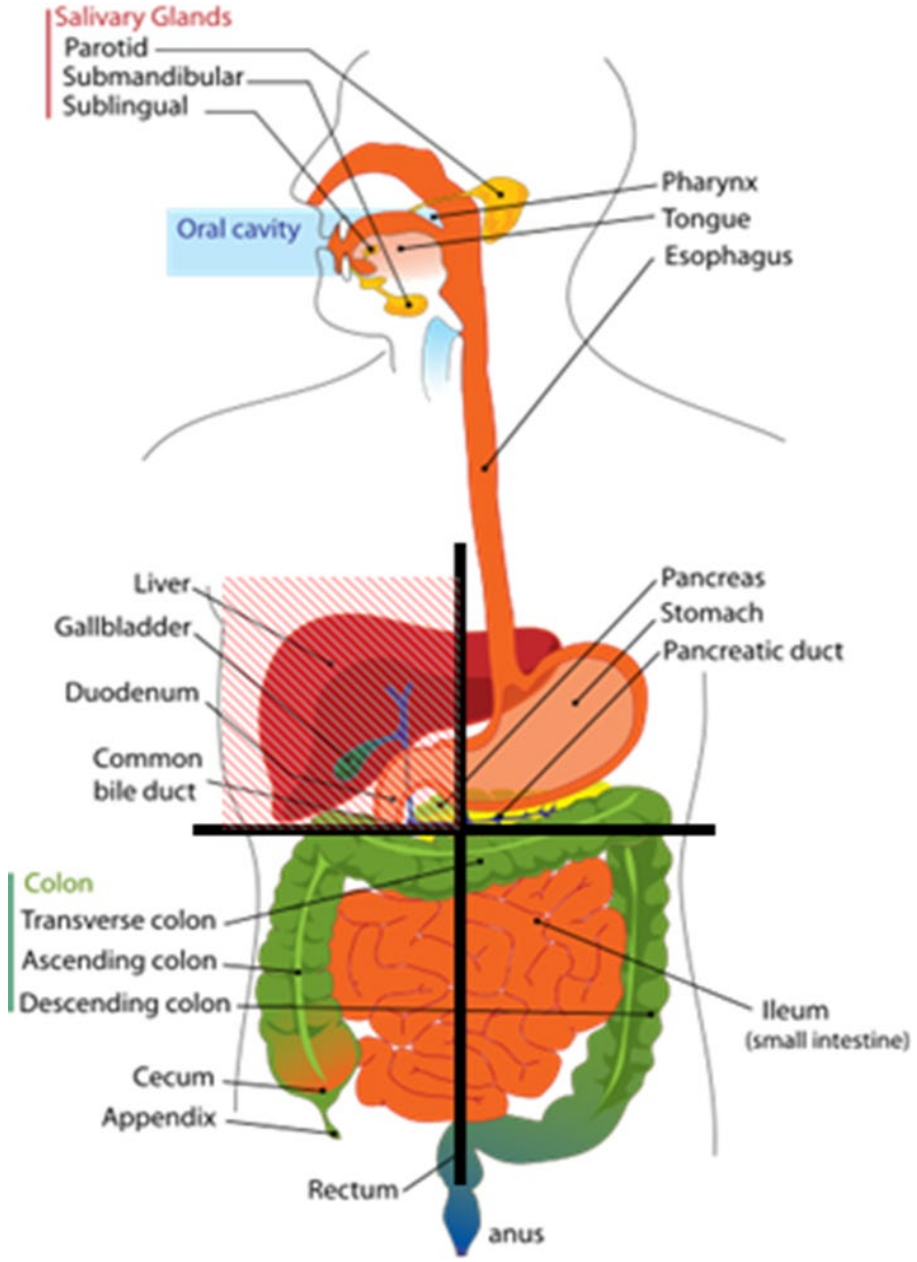
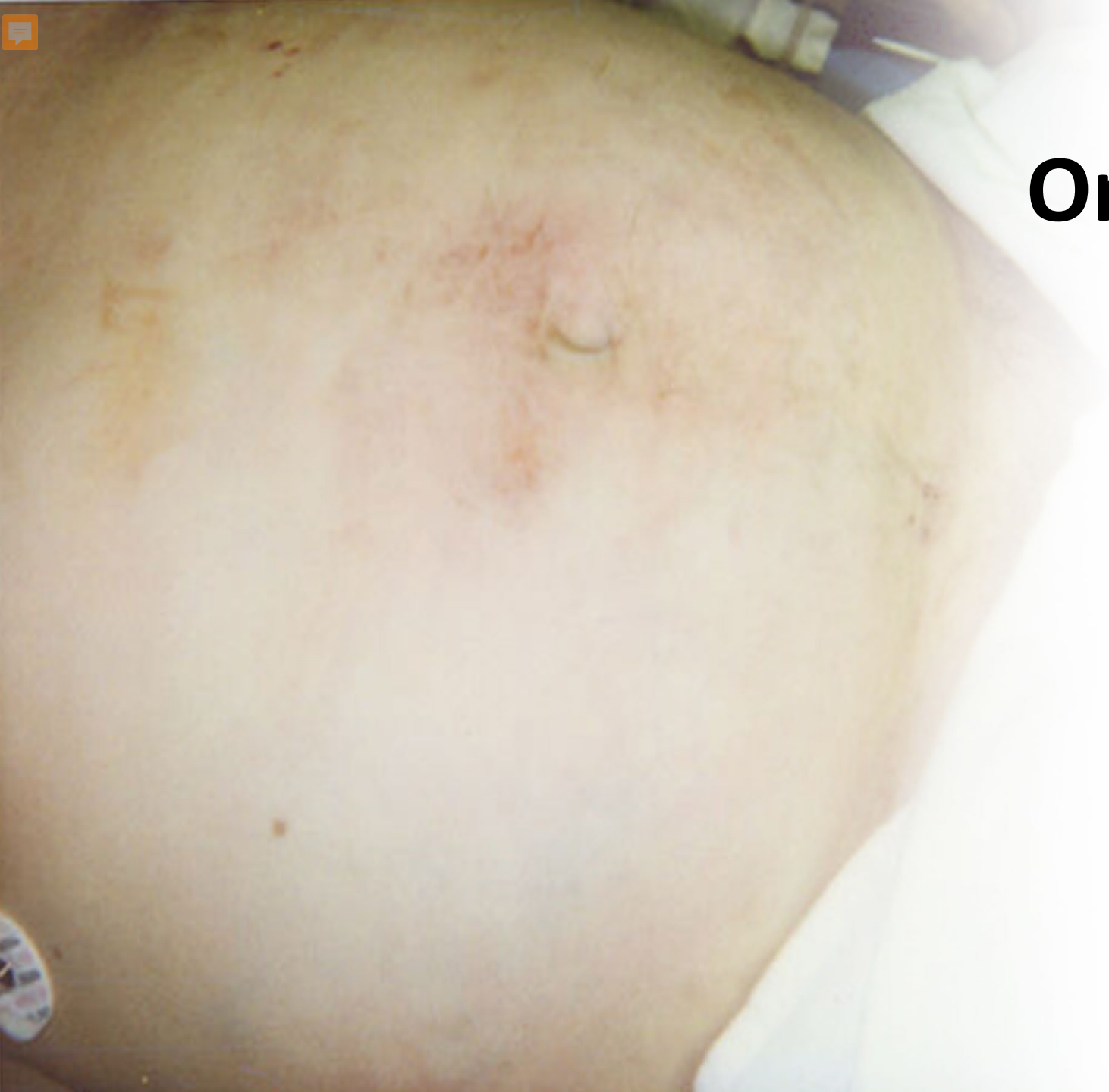
RLQ

- Cecum
- Appendix
- Ascending colon
- Right ovary and fallopian tube
- Right ureter

LLQ

- Descending colon
- Sigmoid colon
- Left ovary and fallopian tube
- Left uterine tube





Ongoing Assessment

- Delayed diagnosis or missed injuries
- Frequent serial and systematic examinations
- Tertiary exam

Diagnostic Labs

Are they necessary?
Reliable?

- Hematocrit
- WBC
- Electrolytes

Diagnostic Labs

- ABGs
- Coagulation studies
- Urinalysis
- Pregnancy
- Pancreatic enzymes
- LFTs

Diagnostic Modalities

- Radiographs
- Diagnostic peritoneal lavage (DPL)
- Ultrasonography (US)
- Computed tomography (CT) scan
- Angiogram
- Diagnostic laparoscopy

Radiographic Films

- CXR
  - Concomitant pulmonary and cardiac injuries
  - Displacement of abdominal organs
- Pelvis
- Plain abdominal films have limited if any role in the acute resuscitation.
  - AP and lateral films may identify fluid or air.
  - Upright film for free air; may disclose ruptured hollow viscus

Diagnostic Peritoneal Lavage

- Used to diagnose intra-abdominal bleeding
- Indications
  - Unexplained hypotension, decreased hematocrit, or shock
  - CT or ultrasound not available
  - Equivocal abdominal examination
  - Altered mental status
  - Spinal cord injury
  - Distracting injuries

DPL

Advantages

- Quick, simple
- Safe
- Low cost
- Relatively accurate
- Grossly positive result

Disadvantages

- Difficult to perform in some patients
- Invasive procedure
- Can miss certain injuries

Complications: Infection, hematoma, false positives, injury, bleeding, unnecessary laparotomy, failure to recover lavage fluid

Note: A urinary catheter and gastric tube should be in place prior to the procedure.

Ultrasound

FAST

- Focused
- Assessment
- Sonography
- Trauma

Ultrasound probe locations and sequence

- Epigastrium
- RUQ
- LUQ
- Pelvis

M-Turbo Courtesy of Sonosite

Ultrasound

- Reliable, fast, safe
- Noninvasive
- Equipment portable
- Performed simultaneously
- Fast exam detects free fluid
- Serial exams
- Leads to fewer DPL's & CT Scans

Disadvantages of Ultrasound

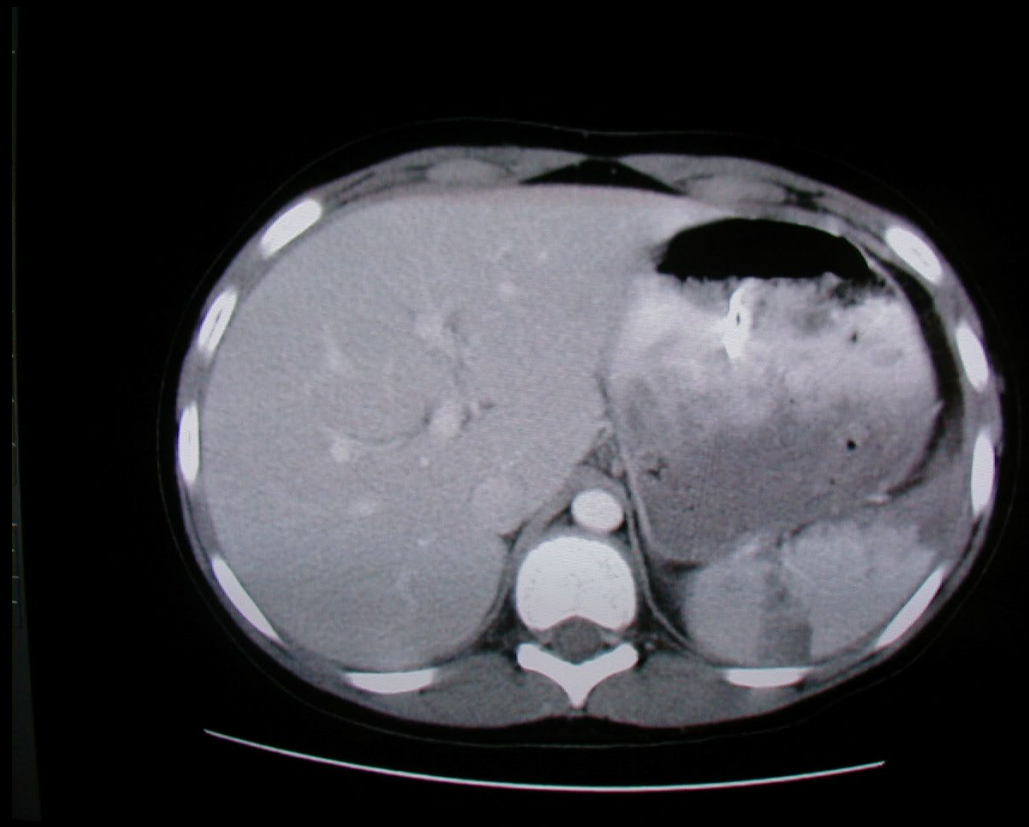
- Clinician expertise variable
- Lacks specificity & sensitivity
- Reliability is questionable
- May not reveal free fluid if performed too early

Computed Tomography

- Used for hemodynamically stable patients
- Advantages:
  - Noninvasive procedure
  - Better defines organ injury
  - Estimates amount of blood in spaces
  - Retroperitoneum and vertebrae can be assessed
- Helical scanners

CT Scan in Trauma

- Visualizes abdominal solid organs and vessels well
- Does NOT see mesenteric injuries, hollow viscus, duodenum, diaphragm, or omentum well
- Whole body scans on all trauma
- Radiation long-term effects



CT Scan Disadvantages

- Takes time to perform
- Cost
- Transport of patient
- Requires stable and cooperative patient
- Less reliable in diagnosing some injuries
- IV contrast
- Radiation exposure

Angiography

- Detects active bleeding in patients with vascular trauma
- Embolizes specific structures within bleeding organs or the pelvis
- Detects A-V fistulas and aneurysms in penetrating trauma

Diagnostic Laparoscopy (DL)

- Screening or diagnostic tool
- Invasive procedure with some limitations
- Used to detect or exclude certain findings
- May reduce the rate of negative laparotomies

Other Diagnostic Procedures

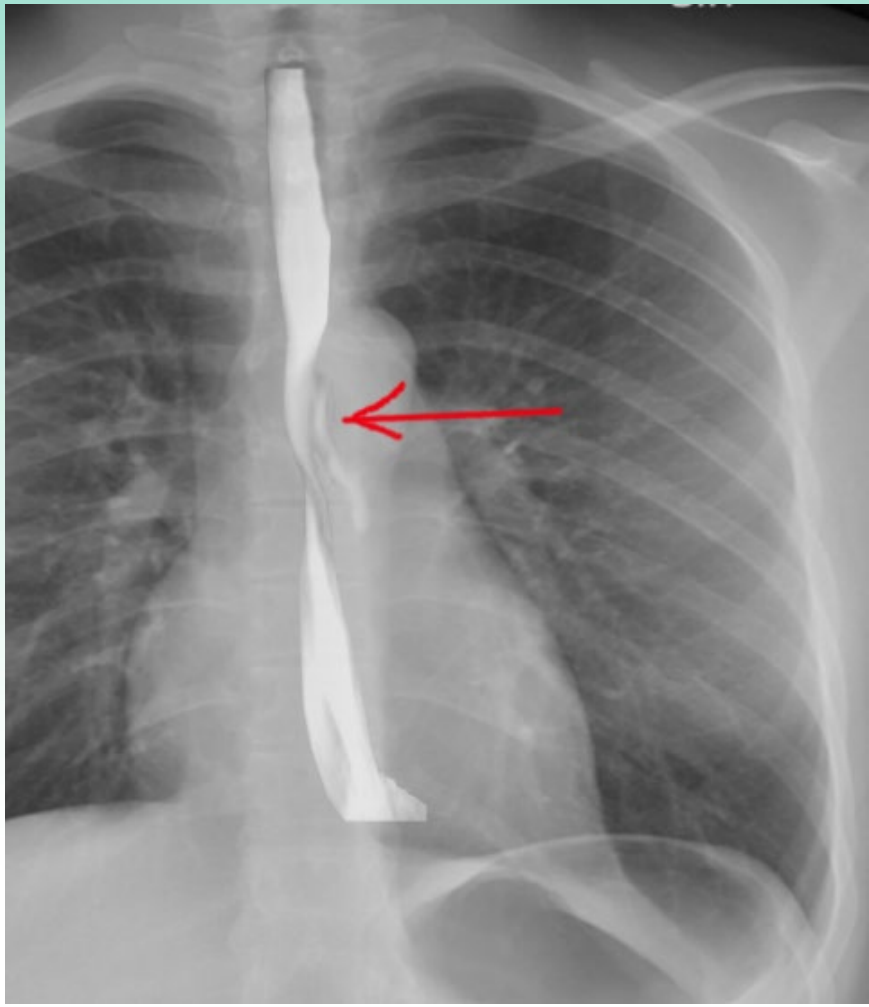
ERCP

- May be indicated in the stable trauma patient suspected of having biliary tract or pancreatic duct injury
- Most accurate test in the patient with hyperamylasemia and in those following pancreatic surgery

Other Diagnostic Procedures

Gastrografin or barium studies

- Helpful in diagnosing injuries to the esophagus, stomach, or bowel
- Contrast enemas are used to diagnose rectal or colonic injury secondary to penetrating trauma



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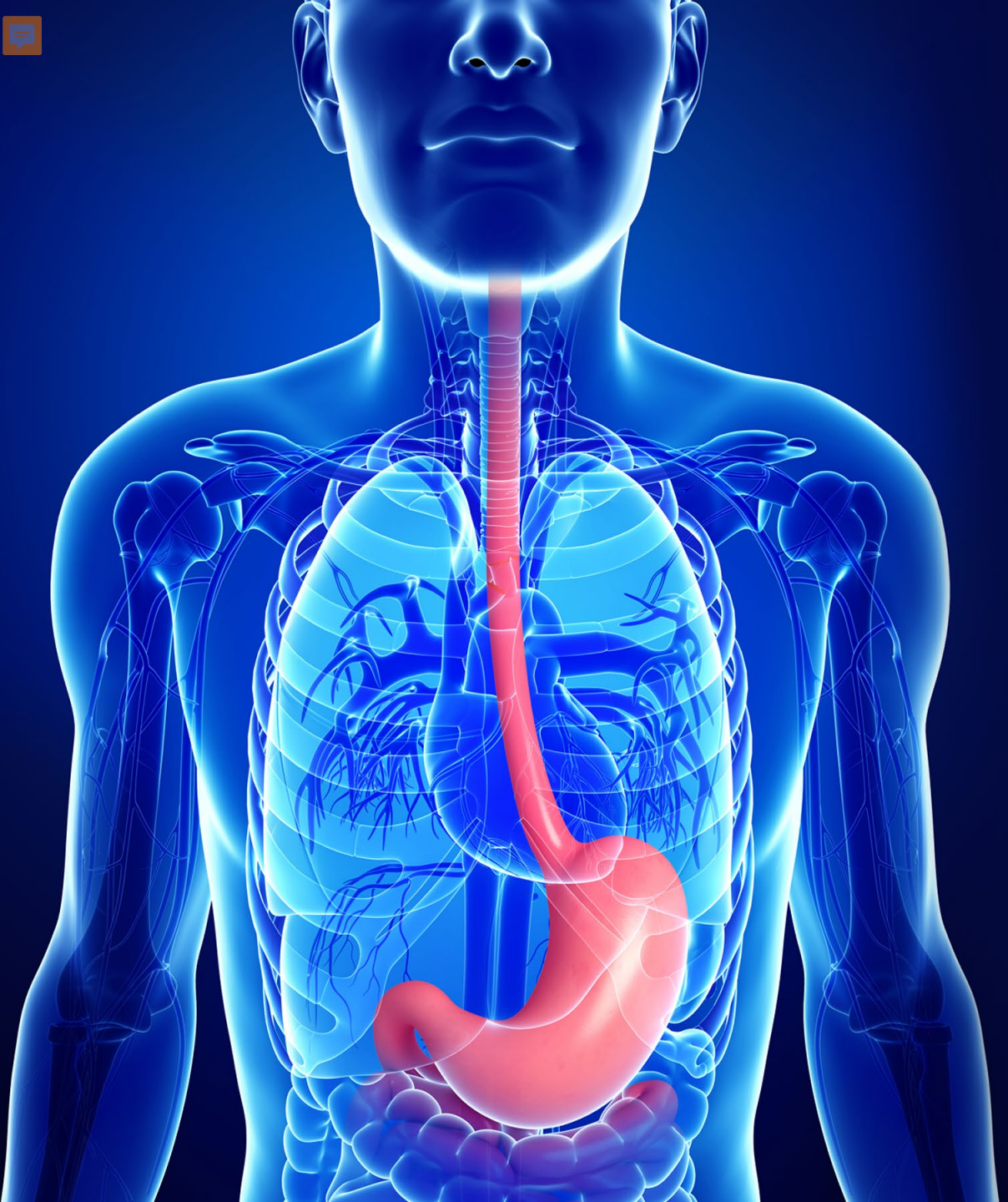
Specific Injuries



Esophageal Injuries

Esophagus

Anatomy

- Carries food from pharynx to the stomach
- Joins the stomach at the level of T-10
- Posterior surface overlies aorta
- Anterior surface covered by peritoneum

Predisposing Injury Facts

- Narrow at
  - Cricoid cartilage
  - Arch of aorta
  - Esophagogastric junction
- Lacks serosal layer
  - Integrity of anastomoses
  - Possible leak after surgical repair

Esophageal Injury

- Incidence
  - Higher in cervical and thoracic areas
  - Majority are due to penetrating trauma
  - Blunt injury is rare
- Early diagnosis essential
- Can result in high morbidity and mortality

Sequelae

- Respiratory compromise
- Mediastinitis
- Paraesophageal abscess
- Empyema
- Esophageal fistula
- Peritonitis

Esophageal Injury

Assessment

- Symptoms of perforation include pain, fever, and dysphagia
- Symptoms of abdominal esophageal tear include signs of peritoneal irritation followed by dyspnea and pleuritic pain

Diagnostic tests

- Endoscopy/Esophagoscopy
- CT

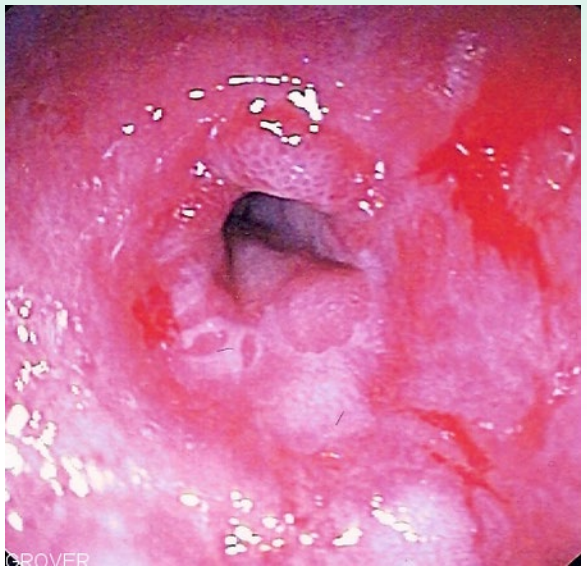
Esophageal Injury

Management

- Initial assessment complex
- Goal is to minimize the bacterial contamination and enzyme erosion
- Gastric decompression
- Antibiotic coverage
- Drainage of wound
- Surgical repair

Esophageal Injury Management

- Continuous monitoring for injury
- Complications after repair



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Diaphragm

Diaphragmatic Injury

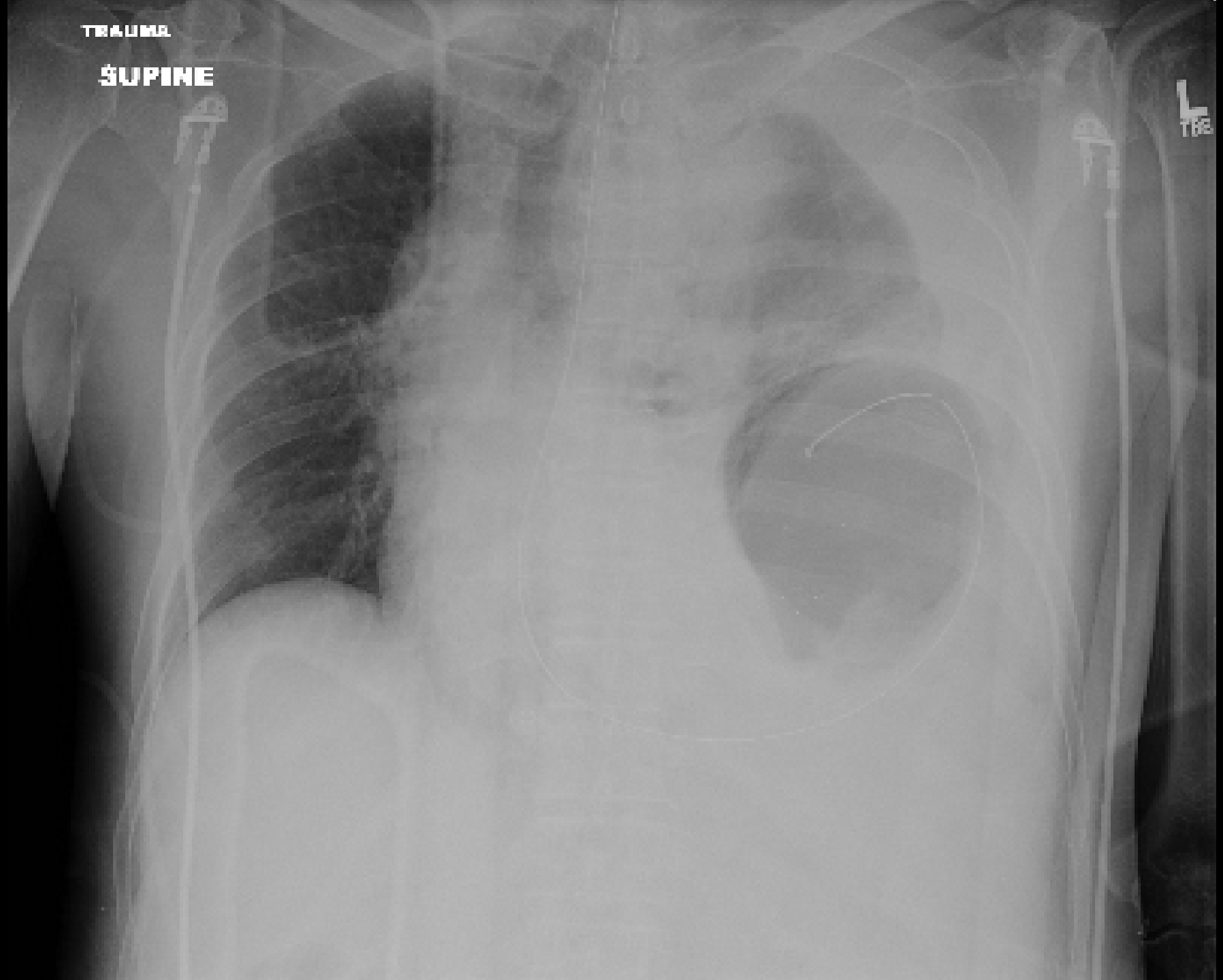
Incidence

- Usually occurs with other injuries
- Seen in < 5% of blunt trauma patients
- Left side greater incidence than right side
- Commonly associated with penetrating trauma
- Injuries from blunt trauma caused by sudden rise in intrathoracic pressure

Diaphragmatic Injury

Assessment

- Auscultation of peristaltic sounds in chest
- Delayed rupture - unexplained chest pain and increased respiratory rate
- CXR is most important diagnostic study
  - Elevation of hemidiaphragm
  - Bowel pattern in the chest
  - Gastric tube curls in chest
  - Hemothorax – associated injury
- Masked by positive pressure ventilation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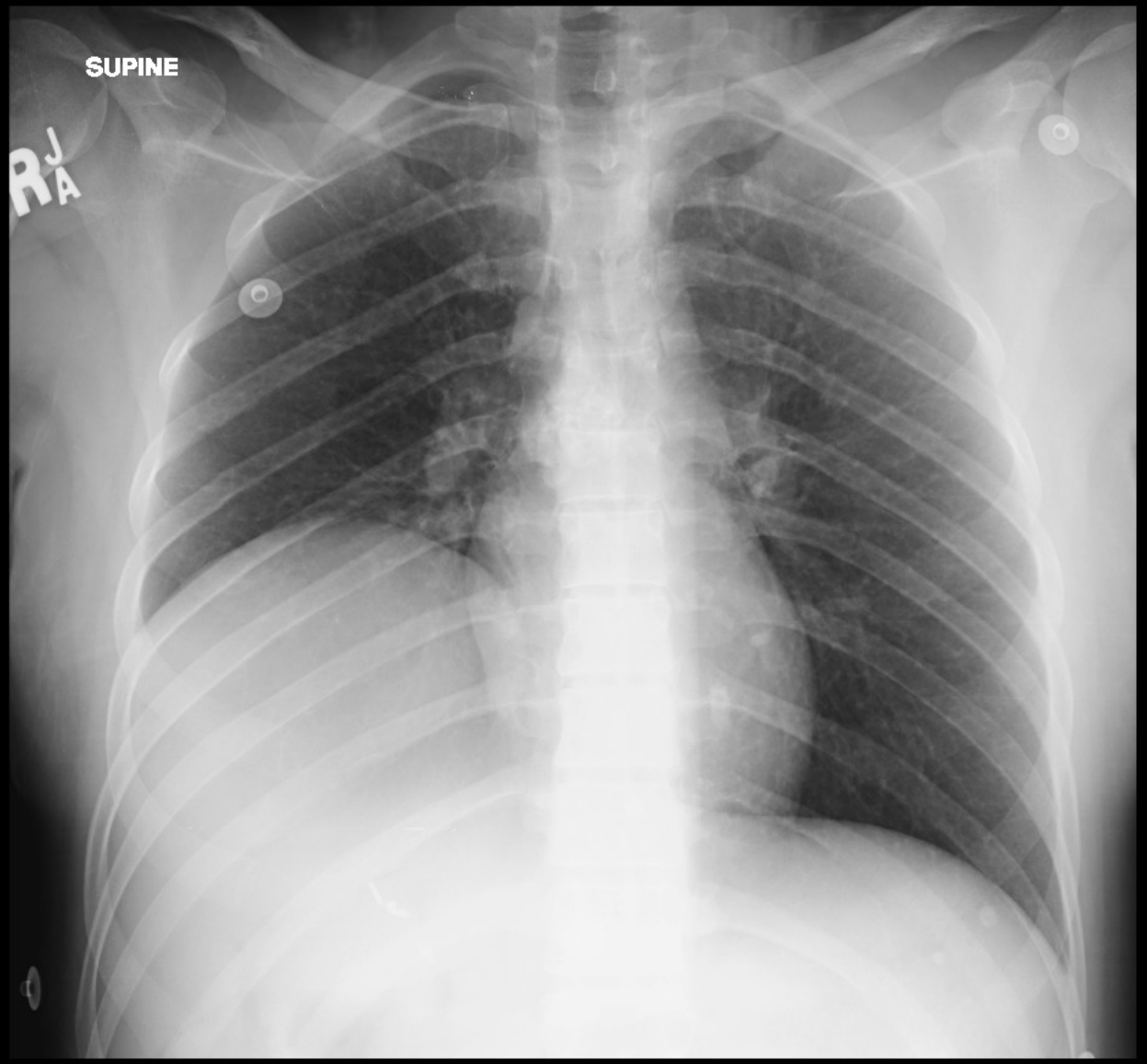

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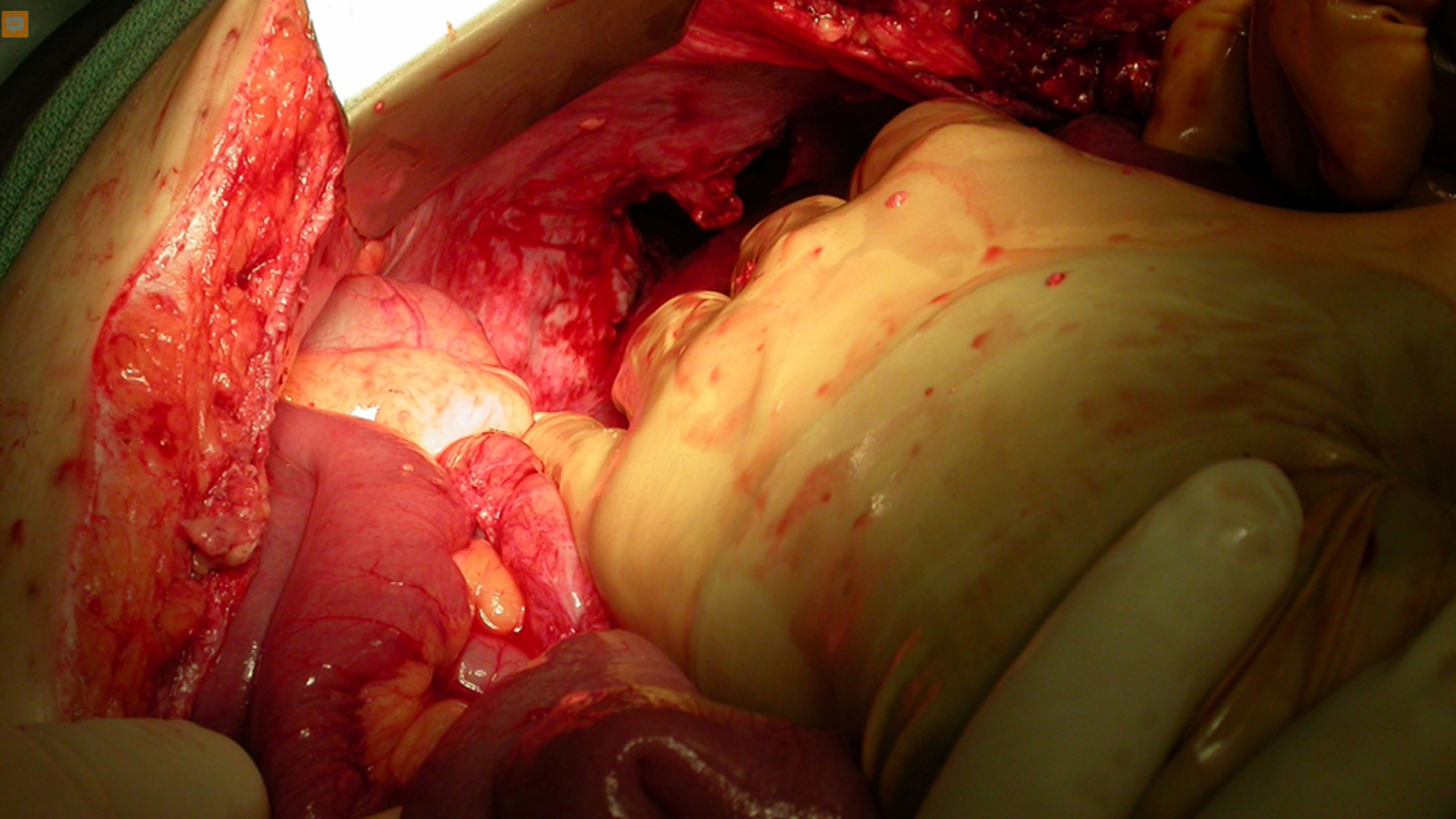
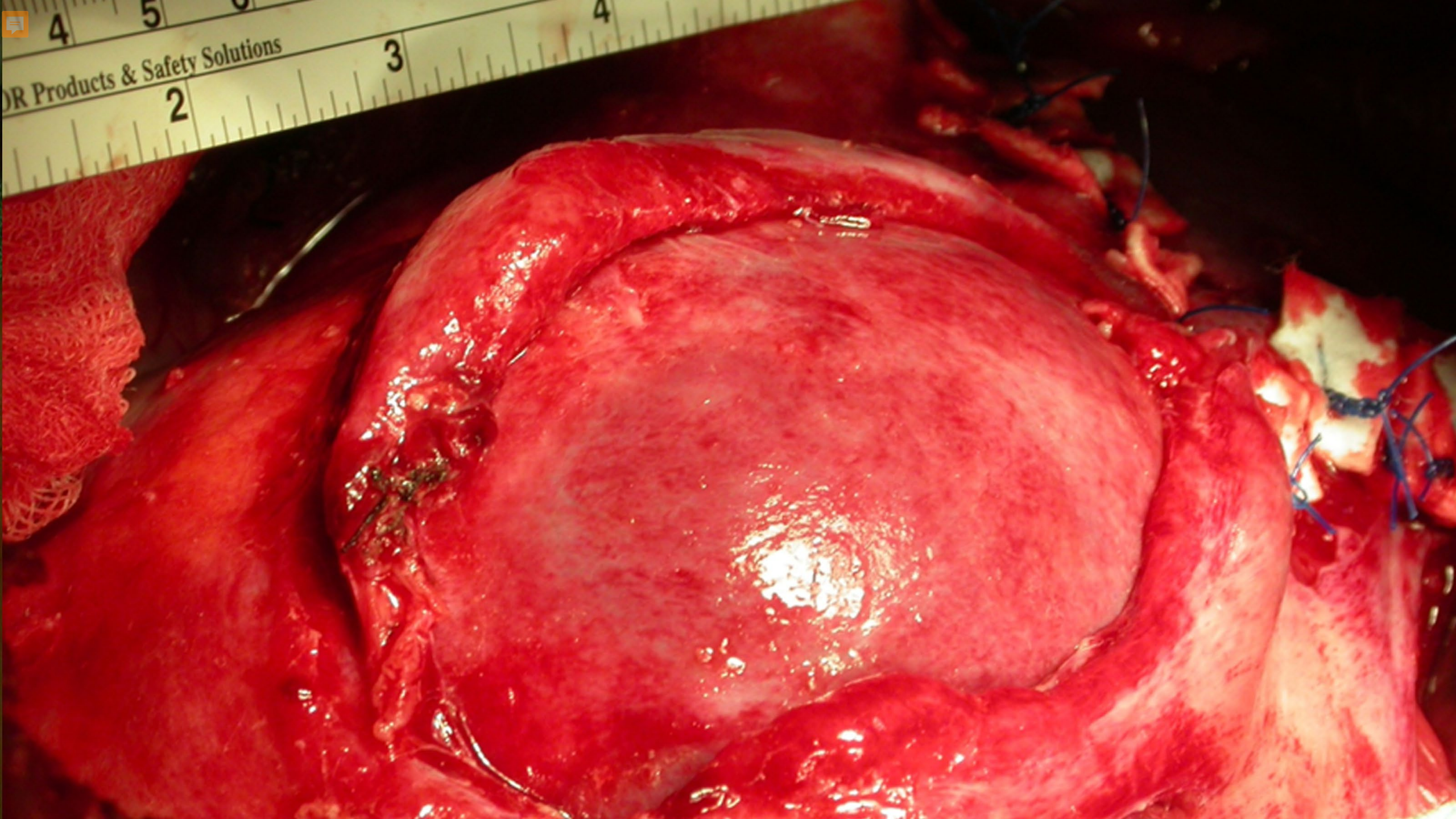
Diaphragmatic Injury

Management

- Exploratory laparotomy
- Diagnostic laparoscopy in penetrating trauma

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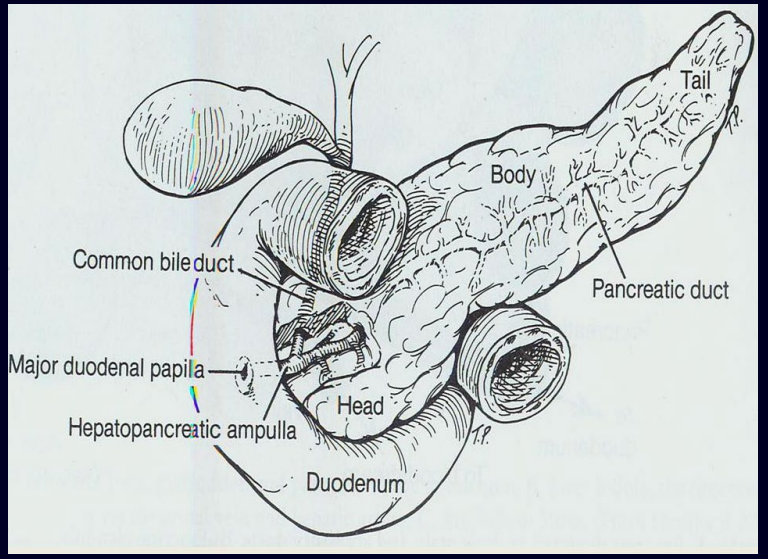
Pancreatic Injuries

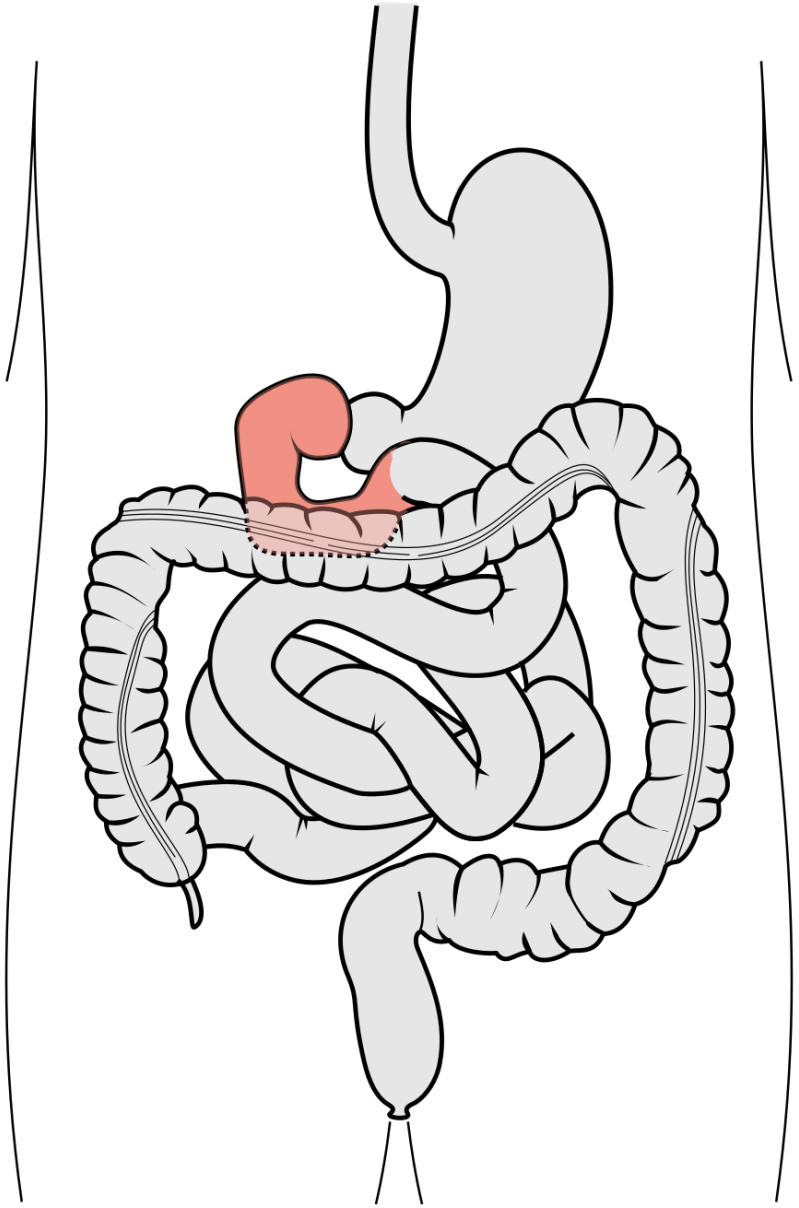


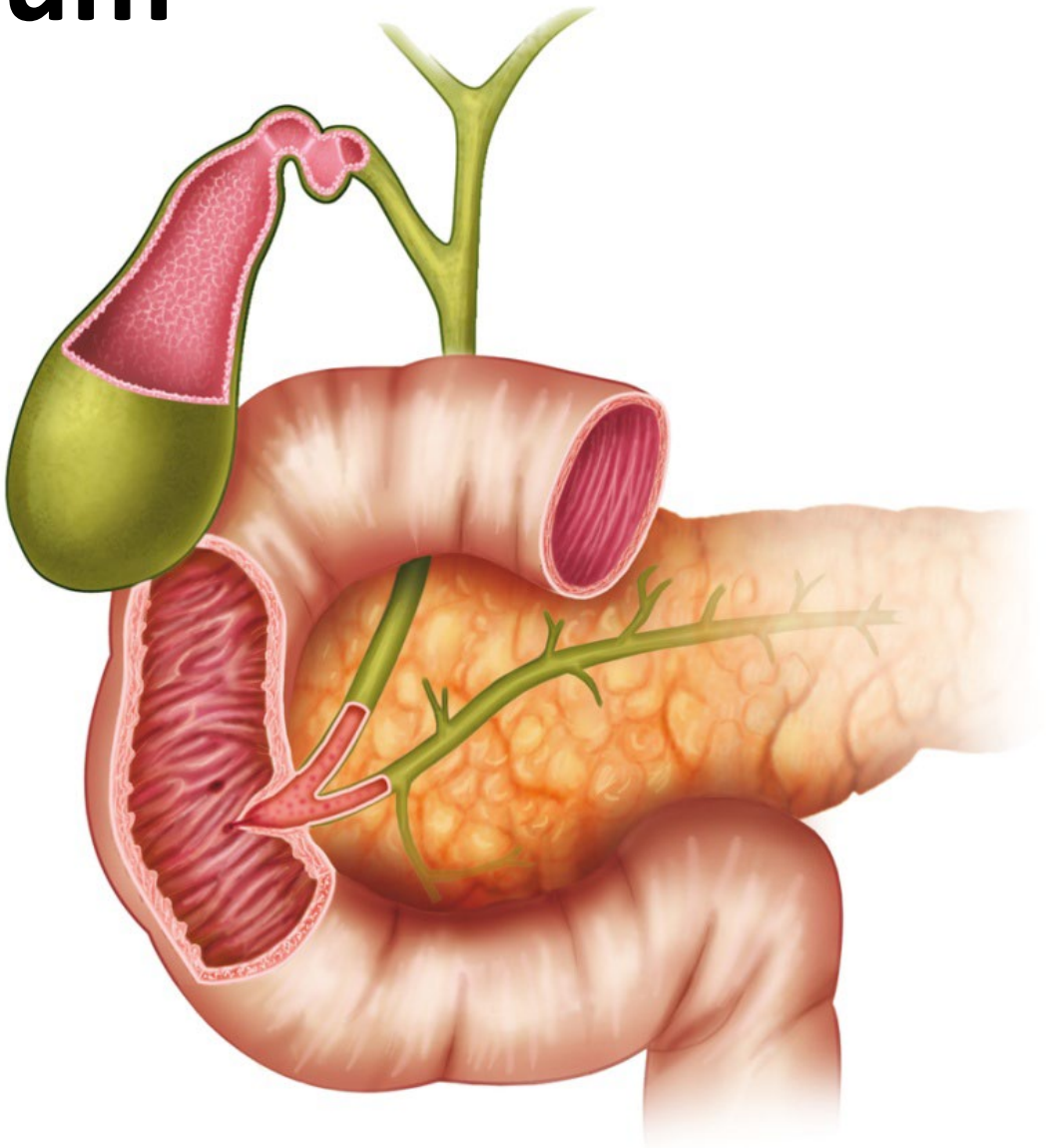
Pancreatic Injuries

Incidence

- Uncommon (0.2% to 12%)
- Associated with other abdominal injuries
- Majority caused by penetrating trauma
- Blunt trauma is usually a direct blow or compression type force
- Mortality is variable
- Pancreatic Injuries graded by severity I-V
- Most grades of III or higher will require OR

Duodenum

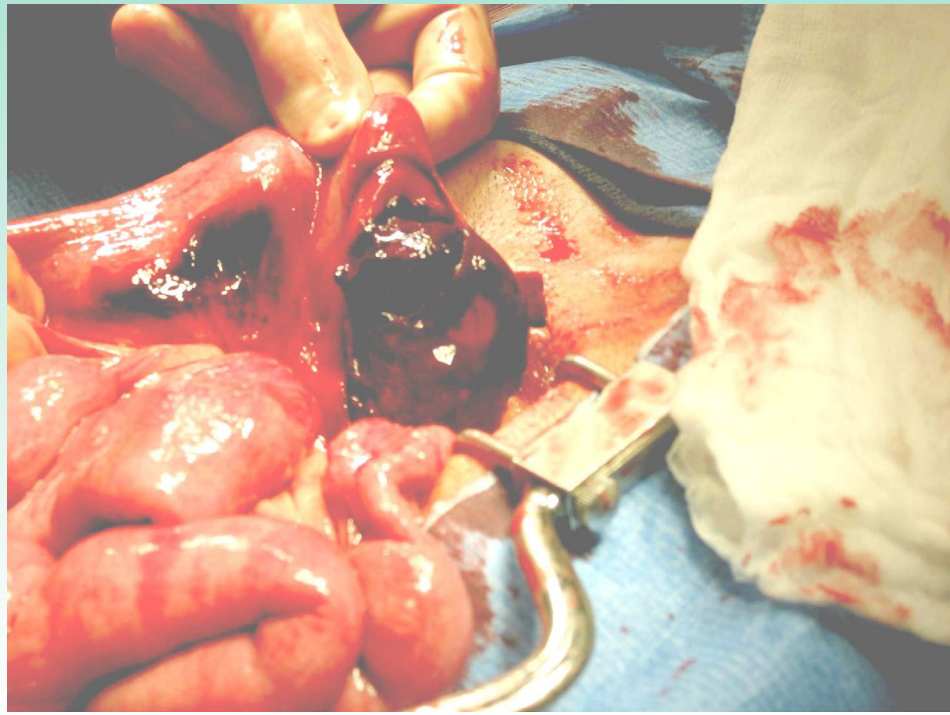




Duodenal Injuries

Incidence

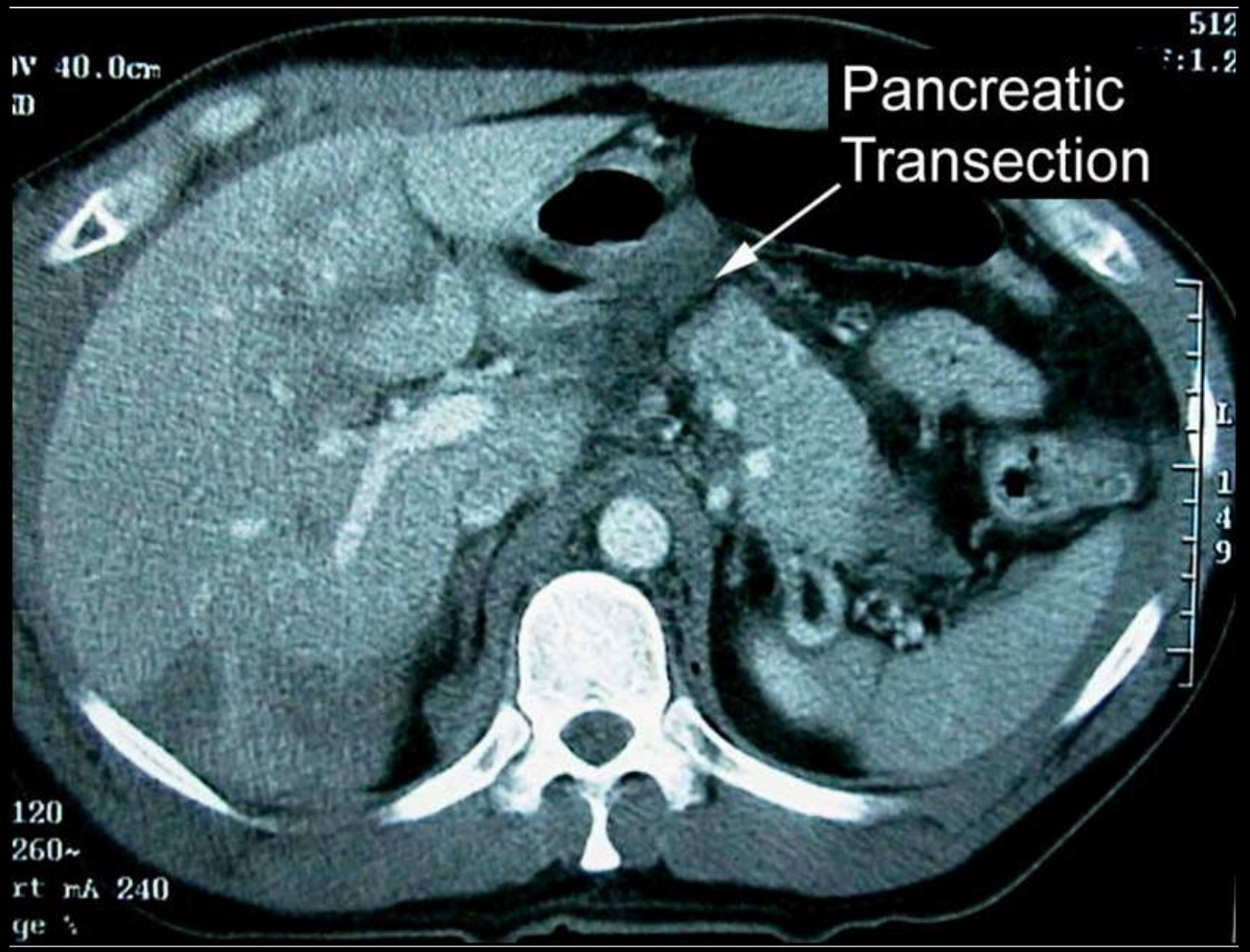
- Majority caused by penetrating trauma
- Blunt trauma is usually compression type
- Mortality is variable
- Multi-organ injuries



Pancreatic and Duodenal Injuries

Assessment

- Peritoneal symptoms not evident but appear later
- CT scan is the exam of choice
- Injury usually found intraoperatively



Pancreatic and Duodenal Injuries

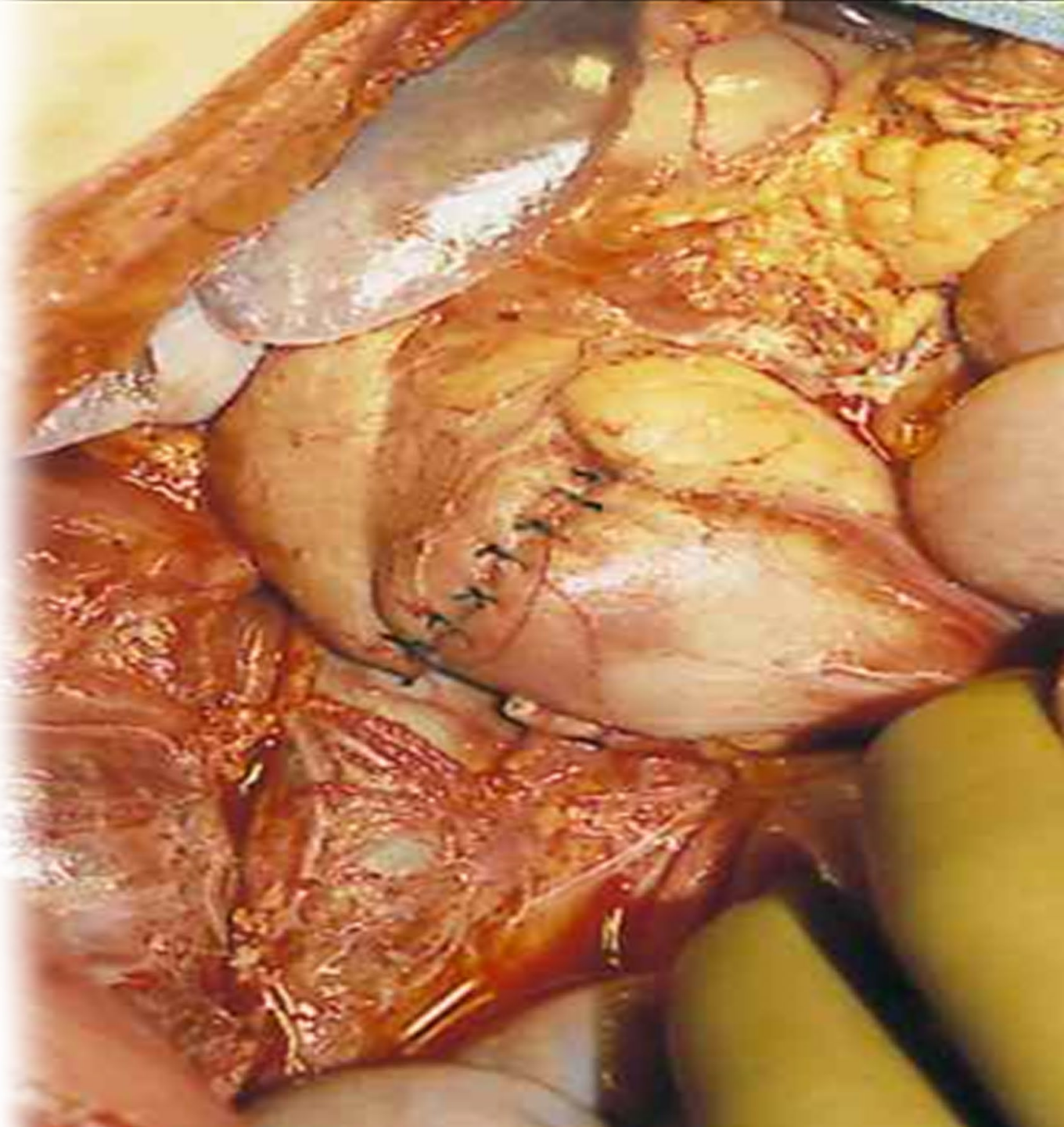
Assessment

- Blunt injury to duodenum can produce intramural hematoma
- Perforation causes contamination

Pancreatic and Duodenal Injuries

Management

- Options depend on site and severity
- Primary closure
- Simple external closed drainage
- Distal pancreatectomy
- Pancreatic duodenectomy



Pancreatic and Duodenal Injuries

Duodenal Management

- Debridement and primary repair
- Surgical procedure depends on hemodynamic stability and duct involvement
- Nonoperative management requires close observation

Pancreatic Management

- Primary cause of death is hemorrhage
- Late deaths are due to sepsis, ARDS, multiple organ failure
- Observe for complications


Injuries to the
Stomach and
Intestines

Stomach Injury

Incidence

- Rare; more common in children
- Commonly involves adjacent organs
- Protected by location and mobility
- Most common cause is penetrating injury

Stomach Injury

Assessment

- Symptoms variable and nonspecific
- May include severe epigastric or abdominal pain, tenderness, signs of peritonitis
- Clouded by associated injuries
- Bloody output from NG tube
- Free air on radiograph
- Findings on CT or DPL

Stomach Injury

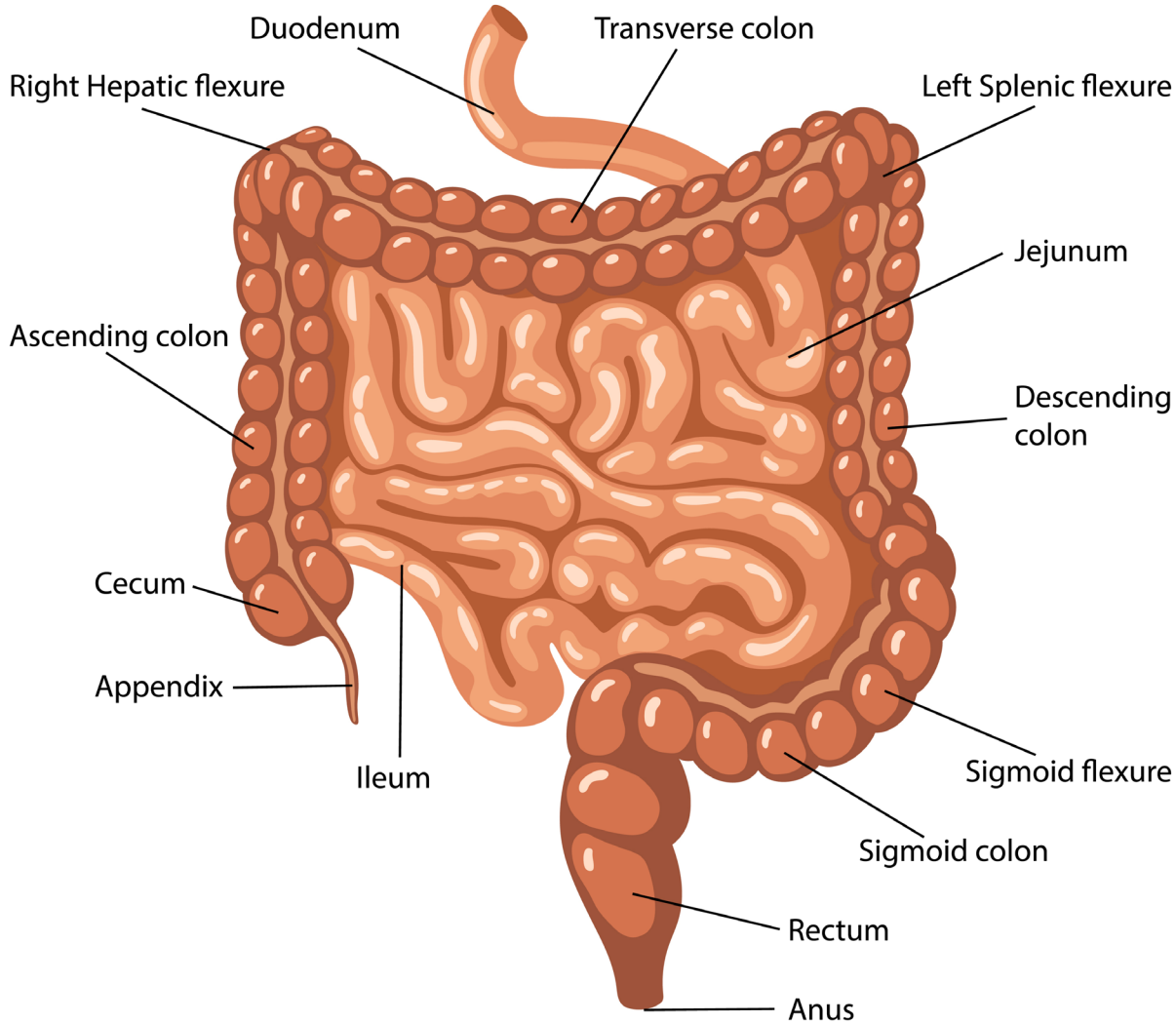
- Indications for surgery
  - Hemodynamic instability
  - Diffuse abdominal pain/peritonitis on clinical exam
  - Studies consistent with GI perforation
- Selective non-operative management
  - Stable
  - No peritoneal signs
  - No clear radiographic evidence

Stomach Injury

Management

- Gastric decompression
- Decision for surgical intervention vs. non-operative management
- If contamination exists, copious peritoneal irrigation and delayed primary closure
- Monitor for postoperative complications

Intestinal Injuries



Small Intestine

Jejunum and Ileum

- Responsible for nutrient absorption and fluid and electrolyte shifts
- Jejunum lies in the umbilical region
- Ileum lies in the hypogastric and pelvic regions
- Vulnerable to seatbelt injury

Small Bowel Injury

Incidence

- Most frequently injured by penetrating trauma.
- Blunt injury is relatively uncommon.
- Presence of pancreatic and solid organ injury are predictive of increased risk for hollow viscus injury.

Assessment

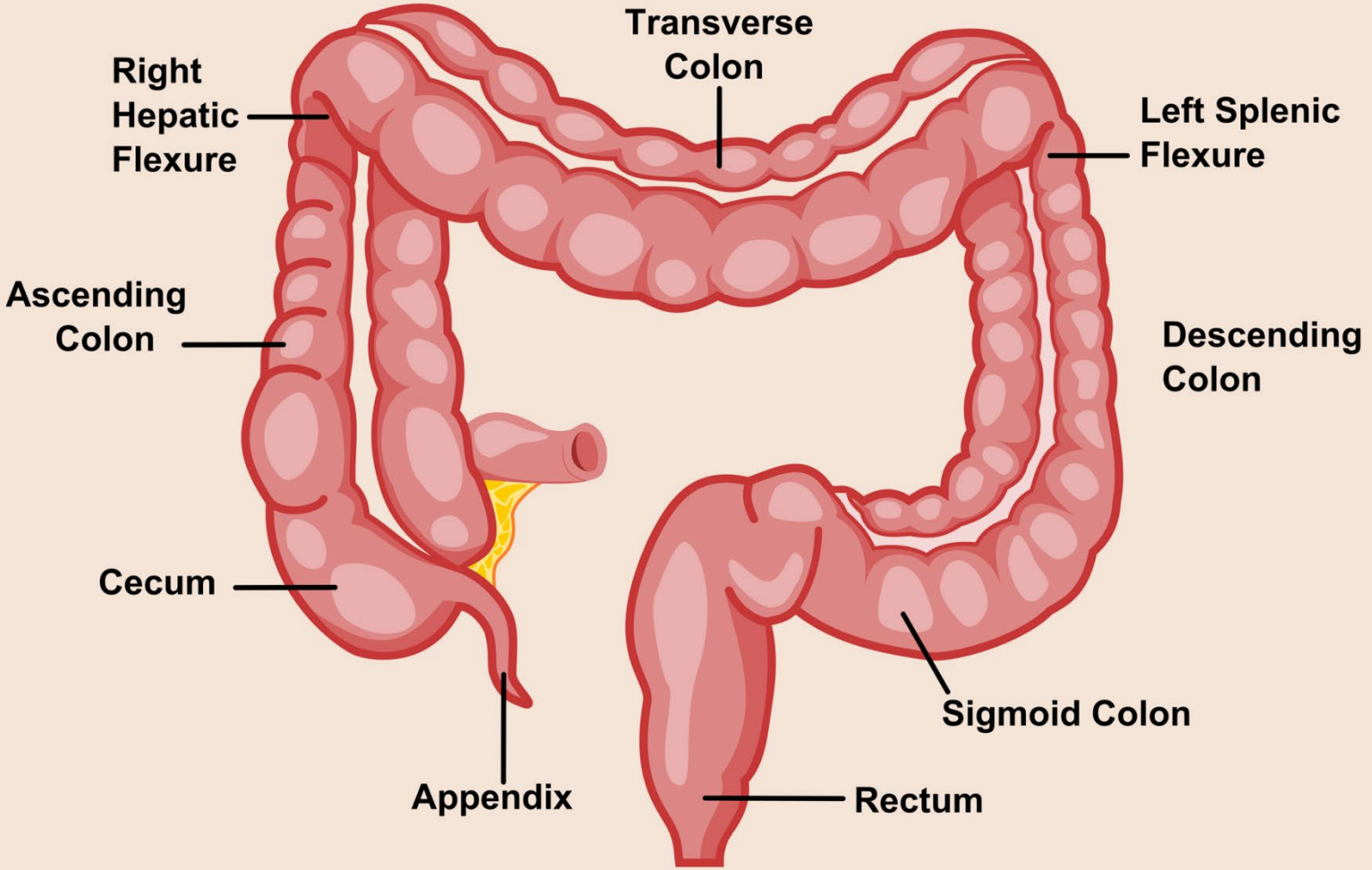
- Clinical signs may not be apparent initially.
- Blunt vs penetrating
- Signs of peritonitis develop.
- Any blow to the abdomen or penetrating injury to the lower chest or abdomen should increase suspicion of injury.

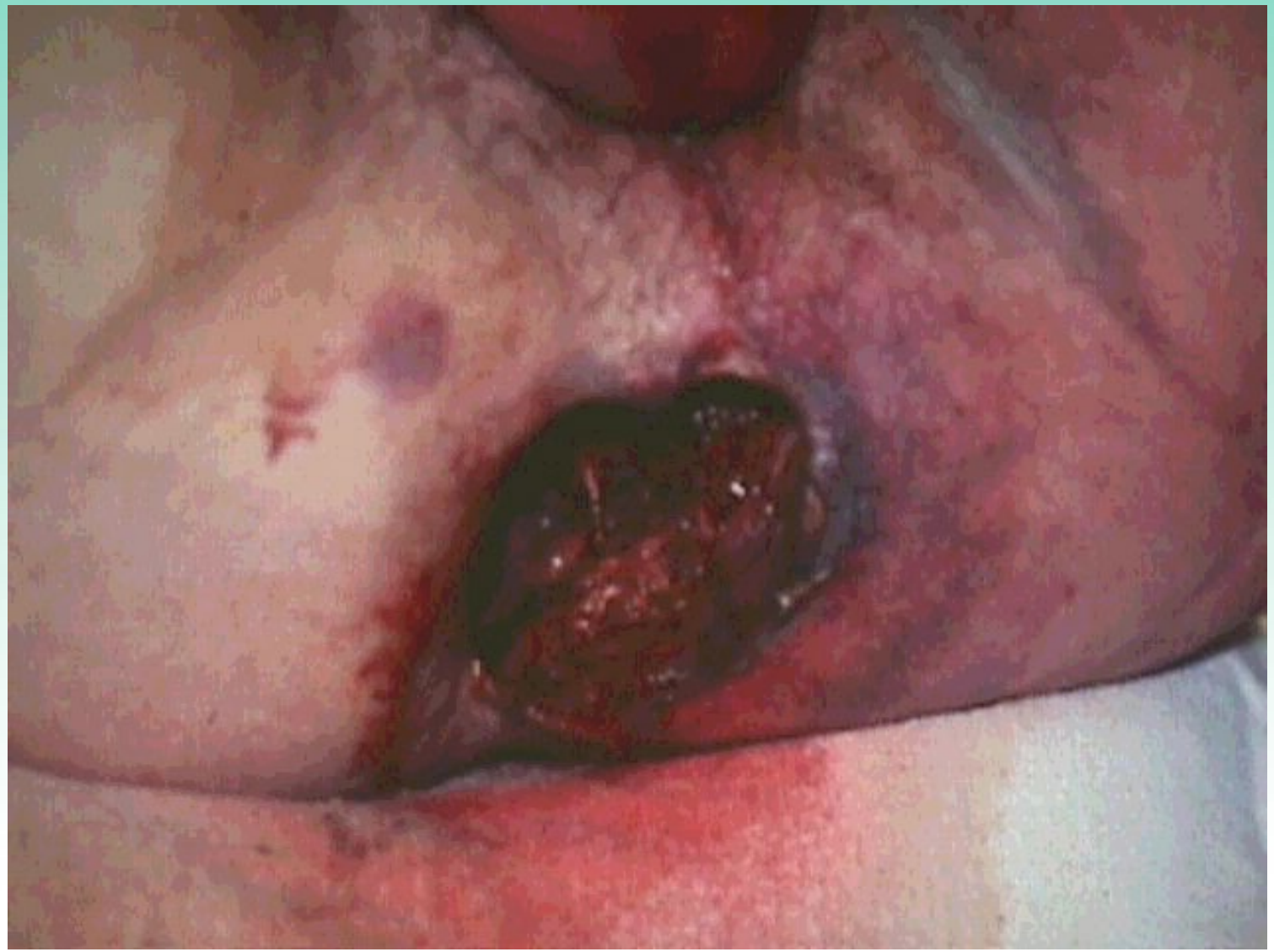
Small Bowel Injury

Management

- Bleeding should be controlled prior to exploration
- Debridement followed by primary closure and ligation of bleeders
- Bowel resection for multiple defects
- Gastric decompression and parenteral nutrition not usually required if isolated
- Antibiotics recommended
- Observe for complications such as wound infection and abscess

Large Intestine





Large Bowel Injury

Incidence

- One of the most lethal abdominal injuries
- Mortality affected by associated injuries
- Penetrating injury is the most common

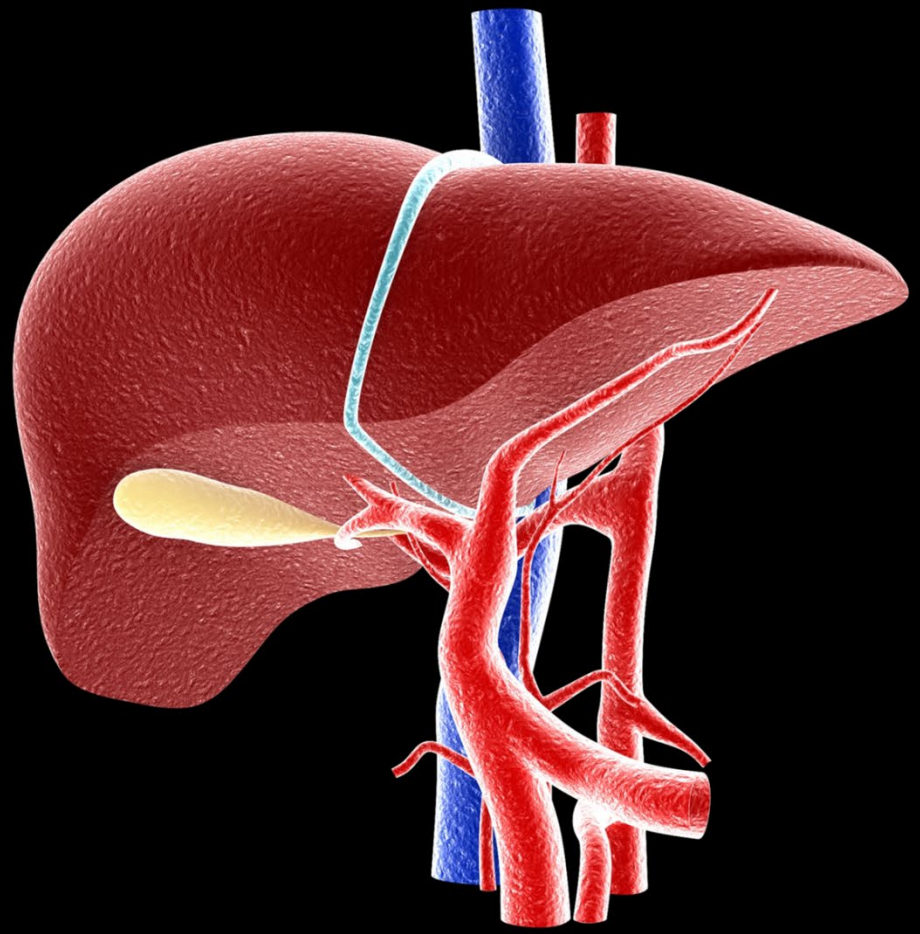
Management

- Early recognition and control of contamination
- Exploratory laparotomy with primary repair and colostomy
- Preoperative antibiotics
- Observe for complications

Liver Injuries

Liver Functions

- Detoxification
- Synthesis of plasma proteins
- Storage of iron and vitamins
- Metabolism of carbohydrates, protein, and fats
- Phagocytization of bacteria



Liver Injury

Incidence

- Commonly injured organ
- MVC most common cause
- Mortality ~10% to 15%

Liver Injury

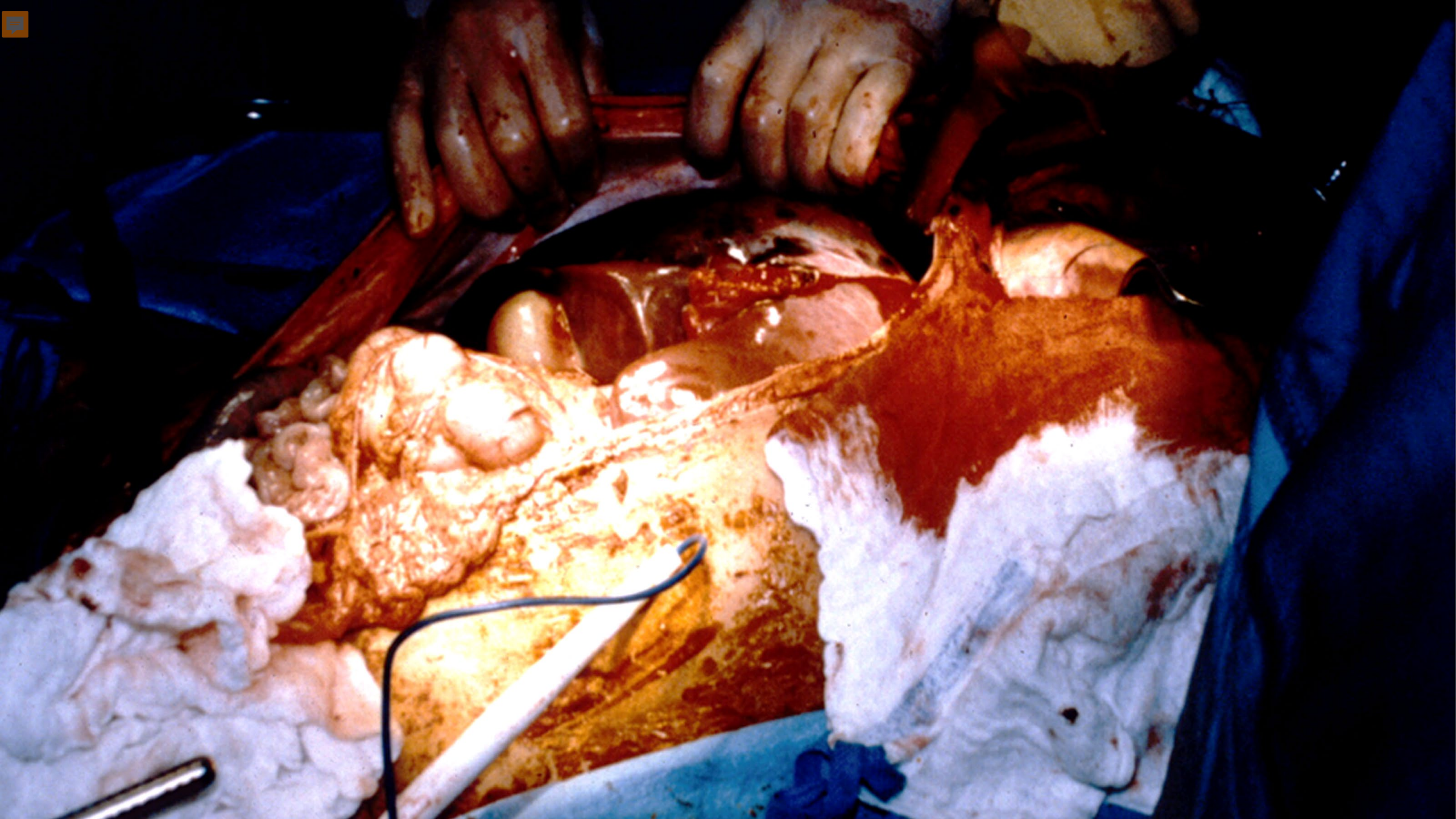
Assessment

- Suspect in any patient with blunt injury to right side
- Penetrating trauma produces a range of injuries
- FAST, CT scan
- Grading system

Liver Injury

Management

- Nonoperative management in select patients
- OR for complex lacerations; arterial blush
- Angioembolization
- Aggressive intraoperative resuscitation
- Possible damage control



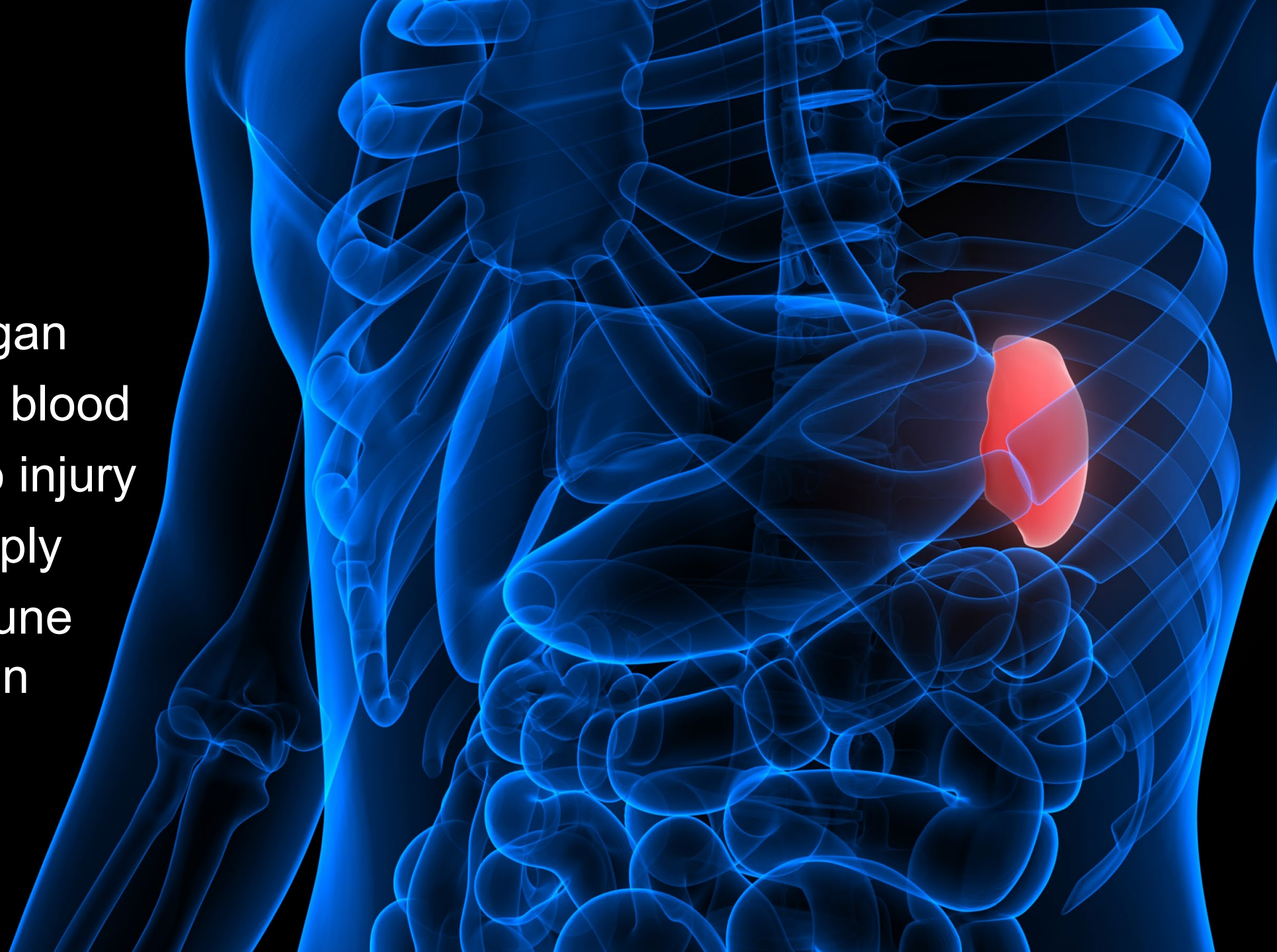
Liver Injury

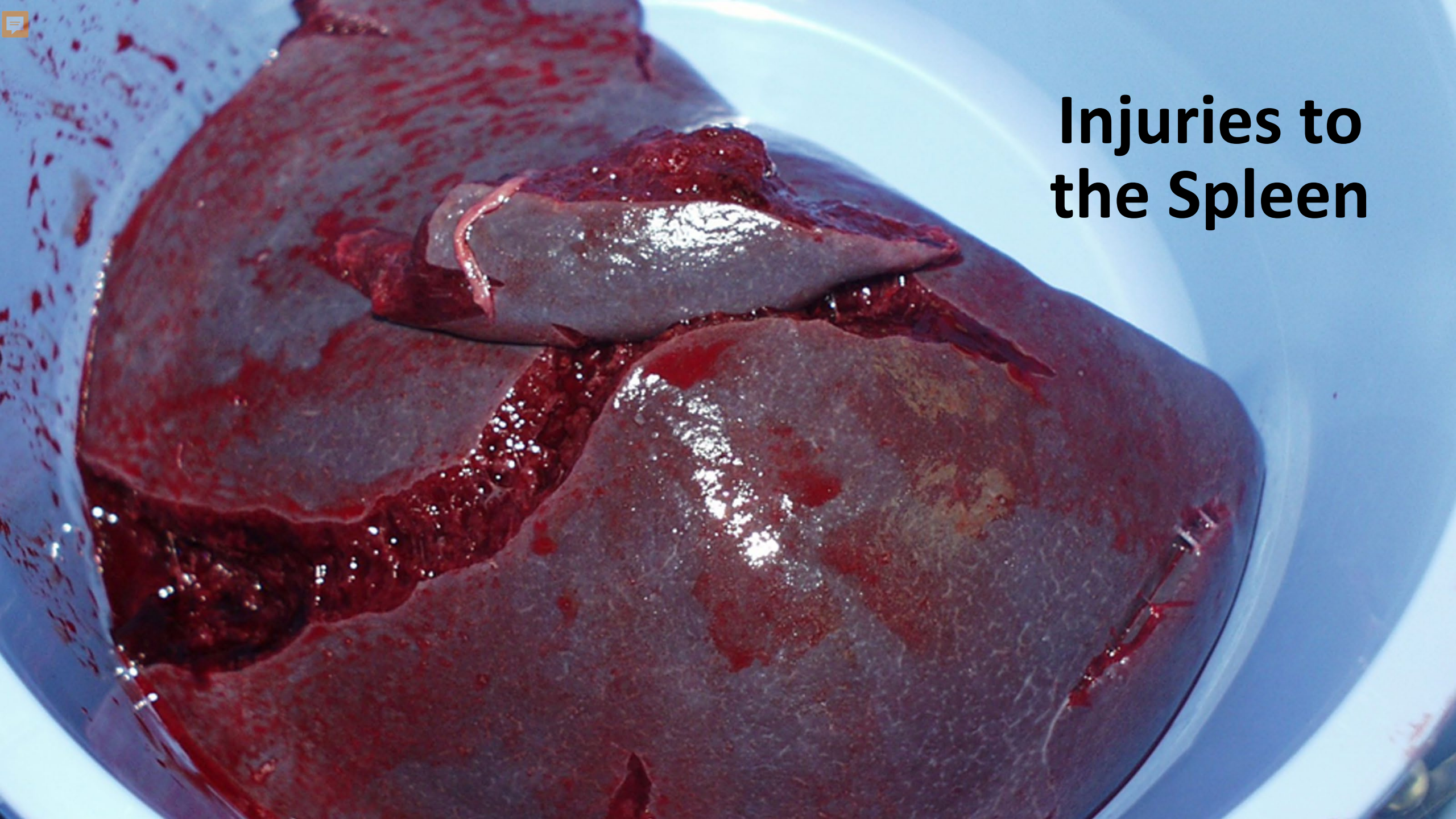
Observe for complications

- Recurrent bleeding
- Hemobilia
- Abscess
- Biliary fistula
- Arterial-portal venous fistula
- Sepsis
- Liver failure

Spleen

- Lymphoid organ
- Reservoir for blood
- Vulnerable to injury
- Vascular supply
- Primary immune defense organ





Injuries to the Spleen

Splenic Injury

Incidence

- 2nd most commonly injured abdominal organ
- Mortality depends on the type of trauma and associated injuries
- Mortality related to uncontrolled hemorrhage, delayed rupture, and sepsis

Splenic Injury

Assessment

- Suspect in any patient with blunt injury to left side
- Penetrating trauma can produce a range of injuries
- FAST, CT scan, Angio
- Grading system

Splenic Injury

Management

- Nonoperative in select patients
- Splenorrhaphy and partial splenectomy
- Splenectomy
- Aggressive intraoperative resuscitation
- Possible damage control

Splenic Injury

Management

- Monitor for failed observation
- Observe for postoperative complications
  - Bleeding
  - Thrombocytosis
  - Gastric distention
  - Pancreatitis
  - Infection
- Ensure vaccines are given prior to discharge

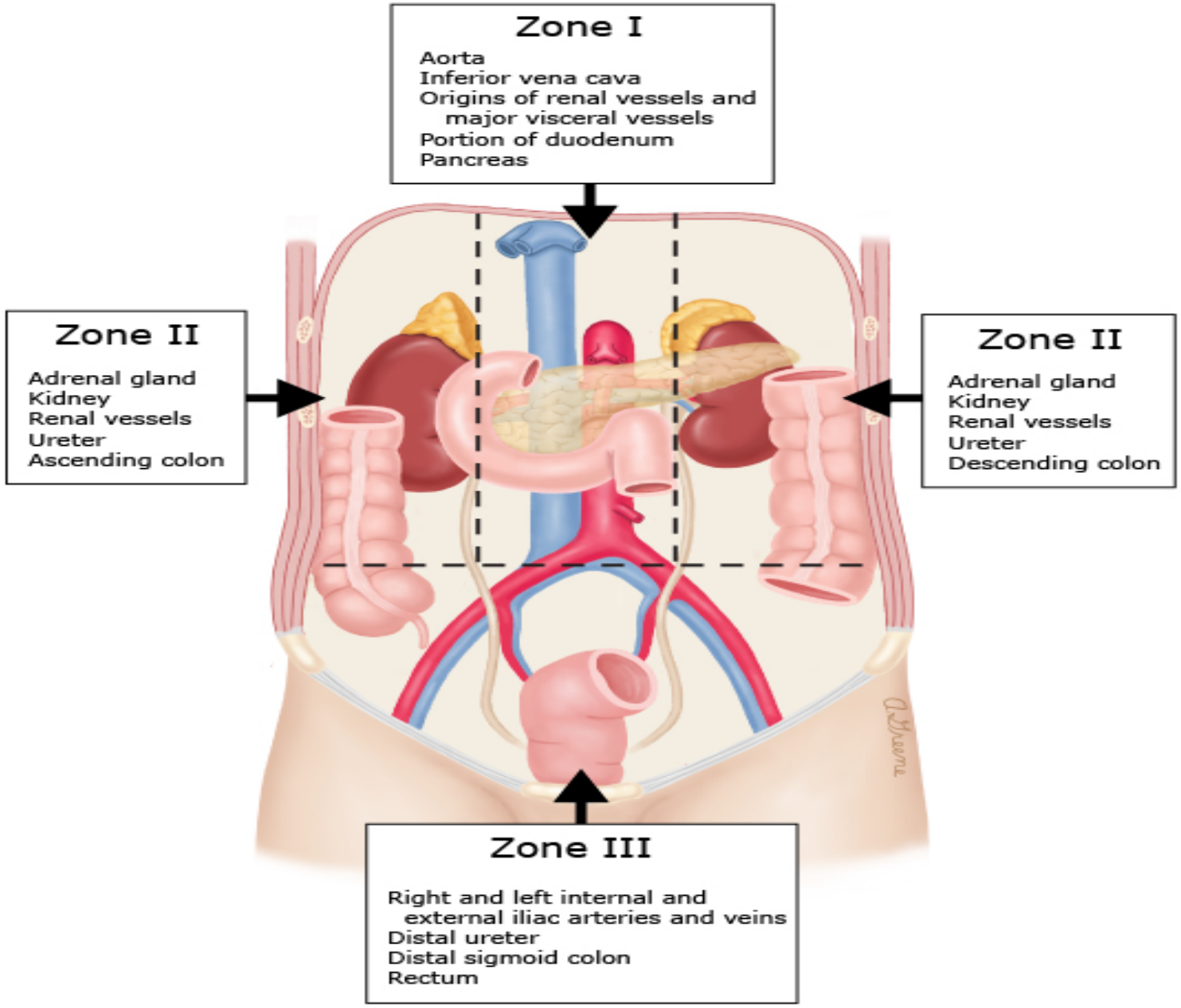
Discharge Instructions

Overwhelming Postsplenectomy Sepsis (OPSI)

- Rare
- Can occur from 1 to 5 years after surgery
- Illness presents with flu-like symptoms, shock from sepsis, and DIC followed by death
- Mortality is 50%
- Preventative measures include vaccinations, chemoprophylaxis and education

Retroperitoneal Hemorrhage

- Management depends on the location
- Penetrating trauma requires exploration
- Blunt trauma – pelvic fractures
- Hematoma – explore vs. leave alone



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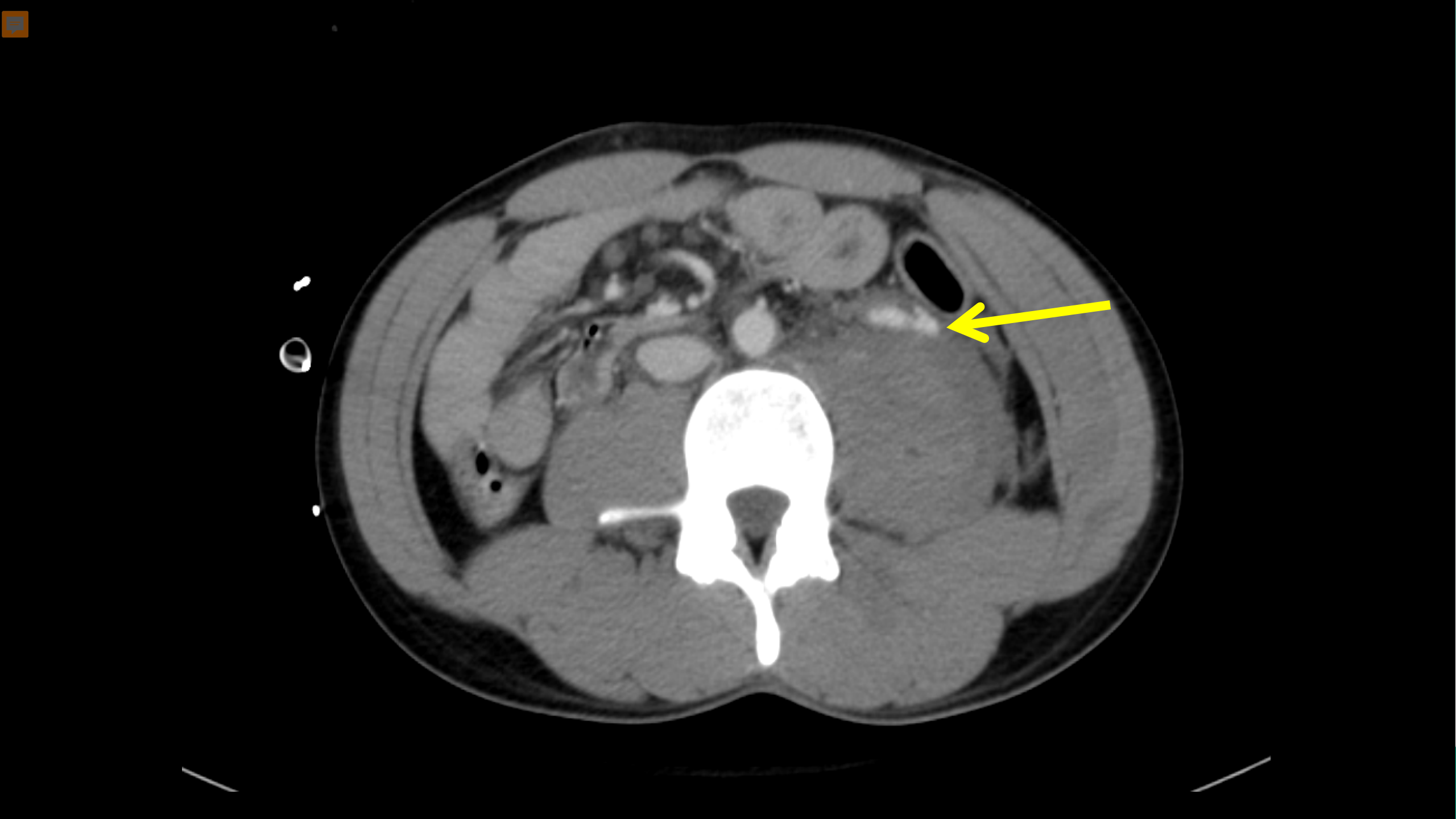
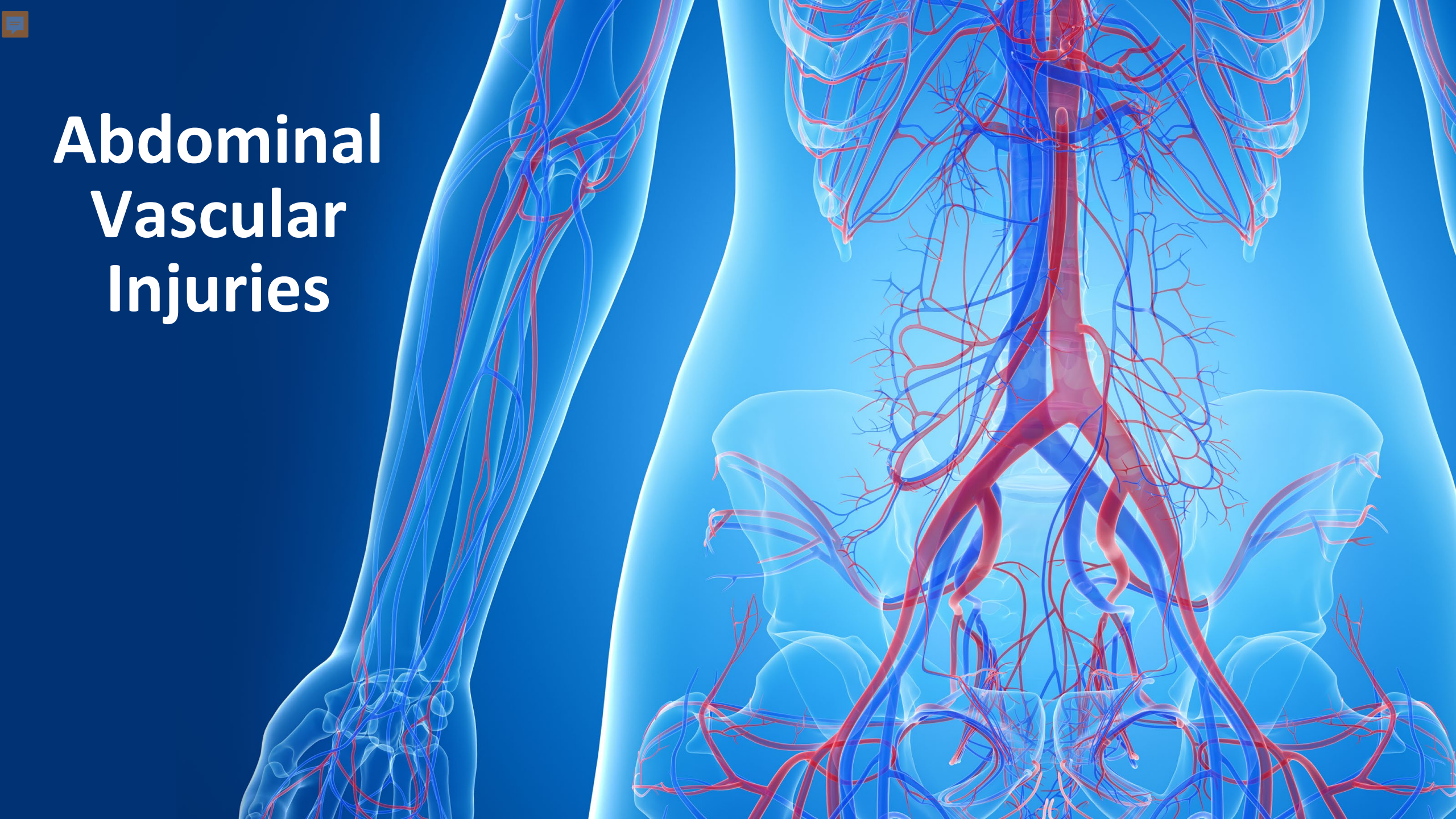


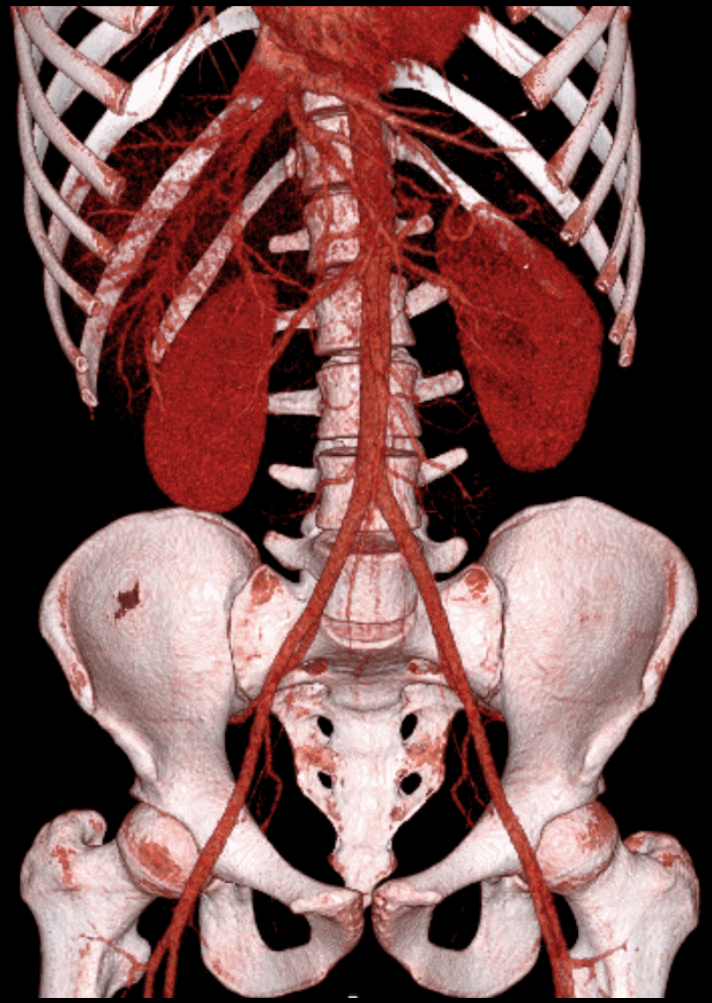
Abdominal Vascular Injuries



Abdominal Vascular Injury

Arterial injury

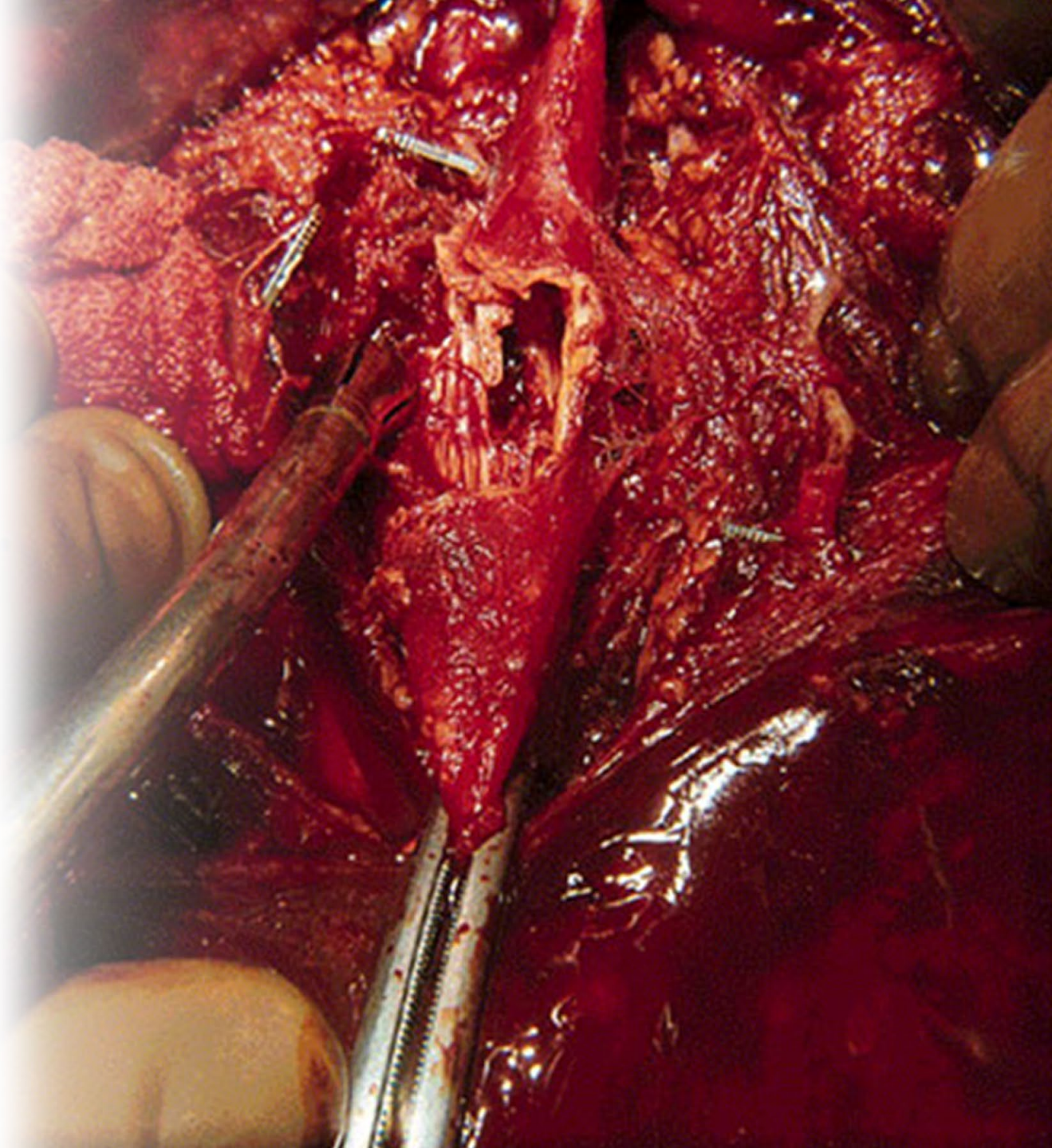
- Can stop bleeding spontaneously
- Usually occur with pelvic, thoracic, or visceral injury
- Vascular signs may be obscured initially
- Symptoms may include abdominal pain, back pain, hypoactive bowel sounds, tender abdominal mass



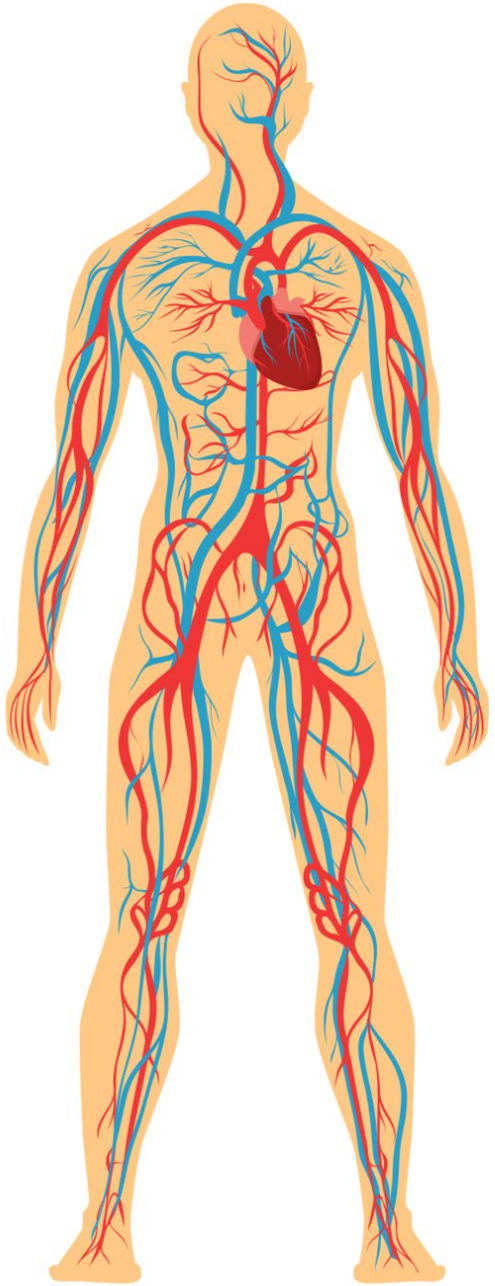
Arterial Vascular Injury

Arterial Injury Management

- BP control
- Blood replacement
- Immediate surgery
- End-to-end anastomosis or graft
- Monitor for adequate volume status postoperatively



Venous Vascular Injury

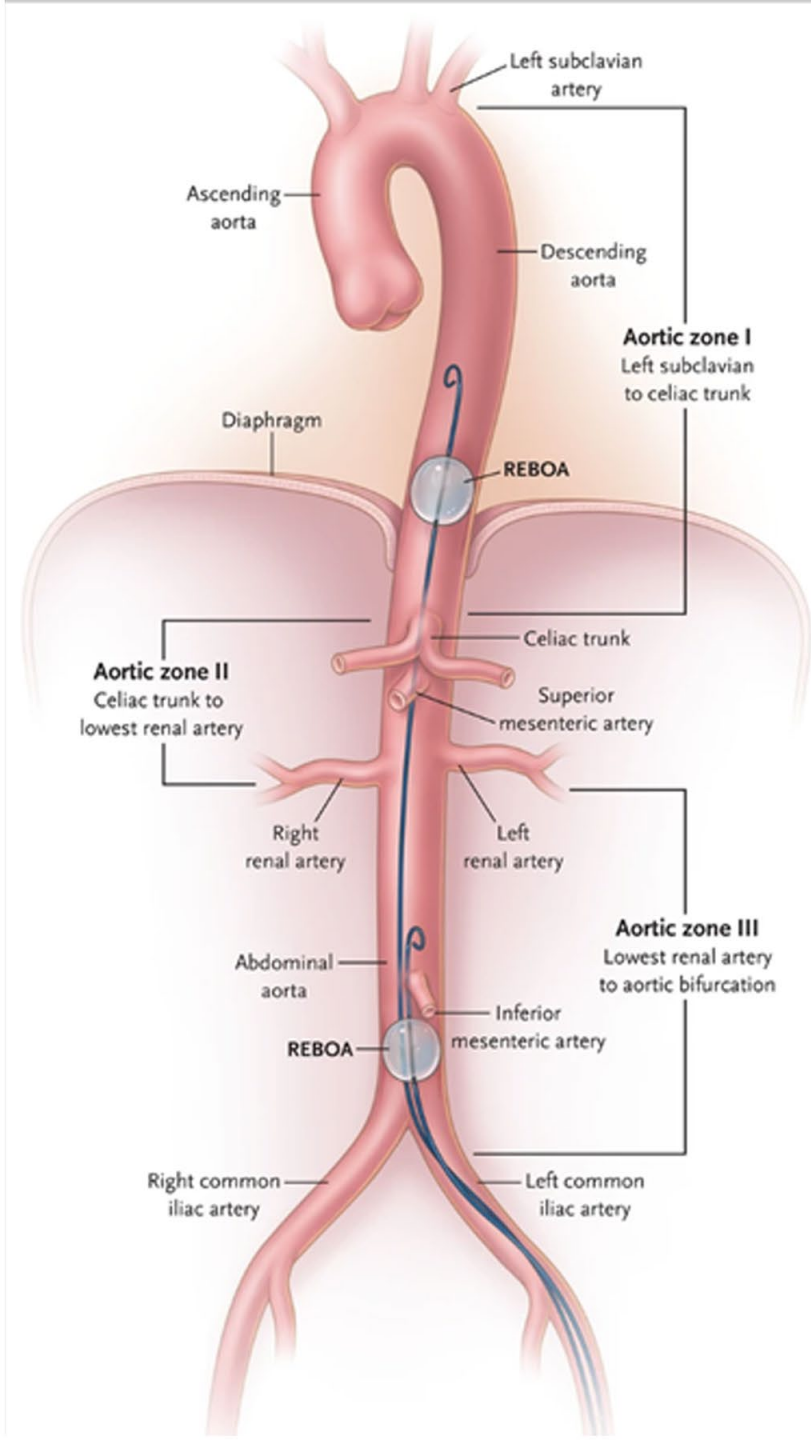


Venous Injury Management

- Quick assessment
- Massive fluid resuscitation
- Pressure and packing
- Operative repair to include ligation and grafting
- Monitor for complications

REBOA

- Resuscitative Endovascular Balloon Occlusion of the Aorta
- Management of non-compressible hemorrhage
- Risk of ischemia and reperfusion injury
- No high grade evidence for improved outcomes



Damage Control

Damage Control

- Abbreviated laparotomy
- Containment of bleeding and contamination
- Temporary intra-abdominal packing
- ICU for physiologic restoration
- Definitive repair

Damage Control

Three phases:

- Control hemorrhage and contamination
- Continued resuscitation in ICU
- Planned reoperation for removal of packing; definitive repair with attempted closure

https://www.documentingreality.com/forum/f149/open-abdomen-dressings-116239/

Did You Know?

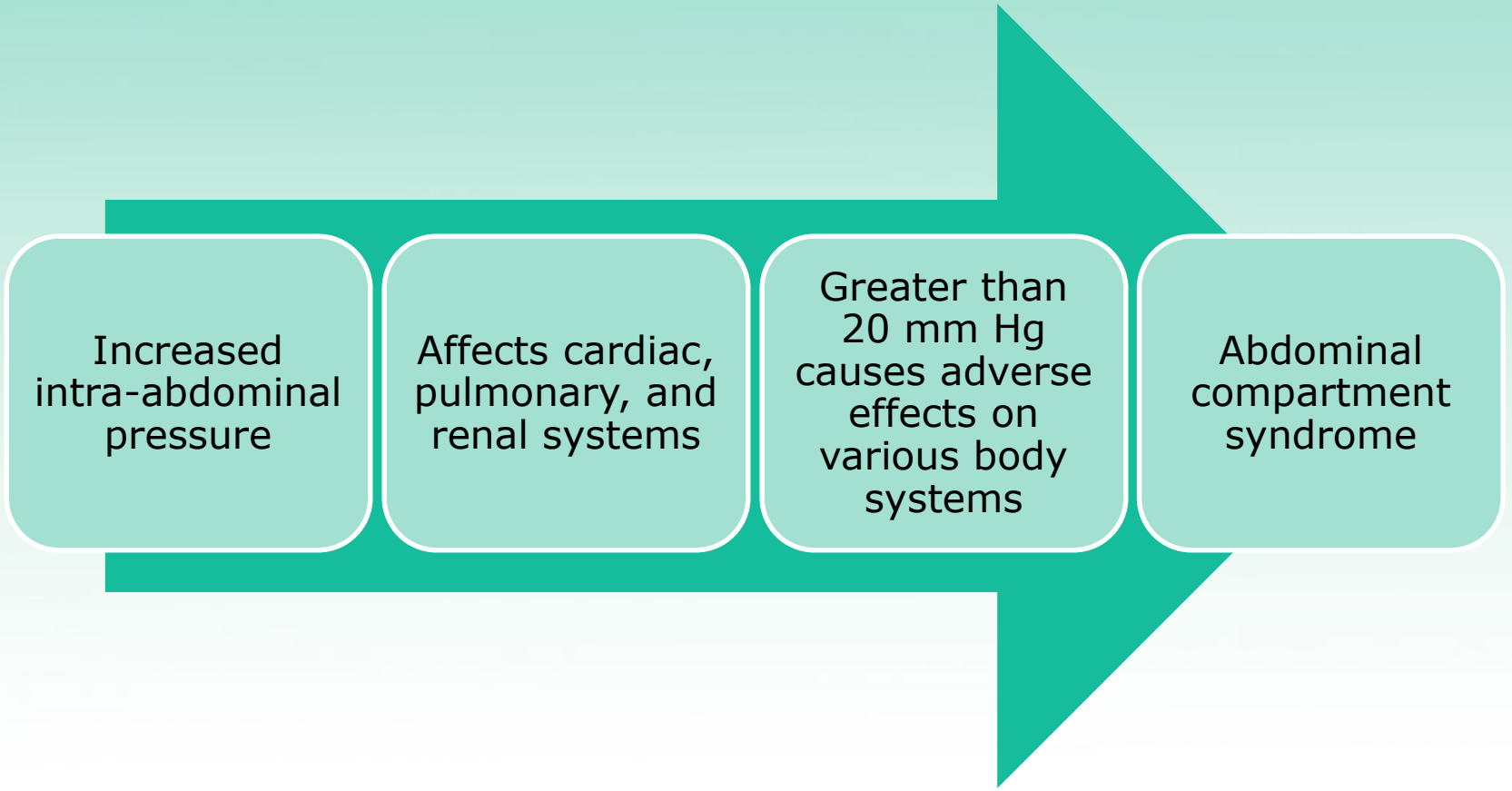
- Generally speaking, a retained sponge at any time during the period which the abdomen is “open” with a VacPak™ or Whitman patch™ is not considered an adverse event and is simply part of the management of “Damage Control” and the open abdomen.
- Check own institutional protocols for details and specific policies

Surgical Counts

- X-ray detectable sponges
- Count “incorrect” on operative record
- Obtain an x-ray at end of permanent closure
- Document when x-ray is done in lieu of count

Complications of Abdominal Trauma

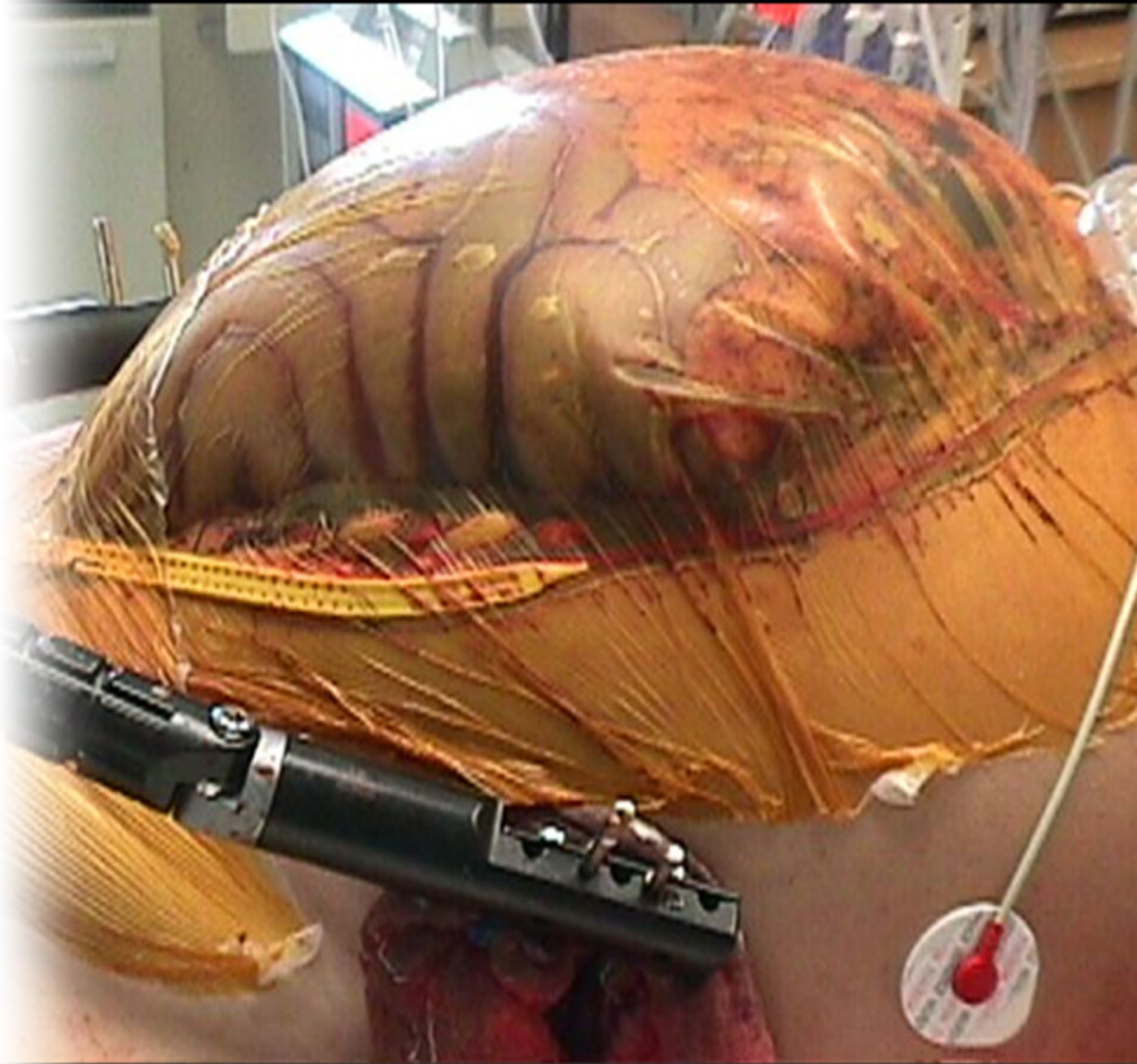
Abdominal Compartment Syndrome



Abdominal Compartment Syndrome

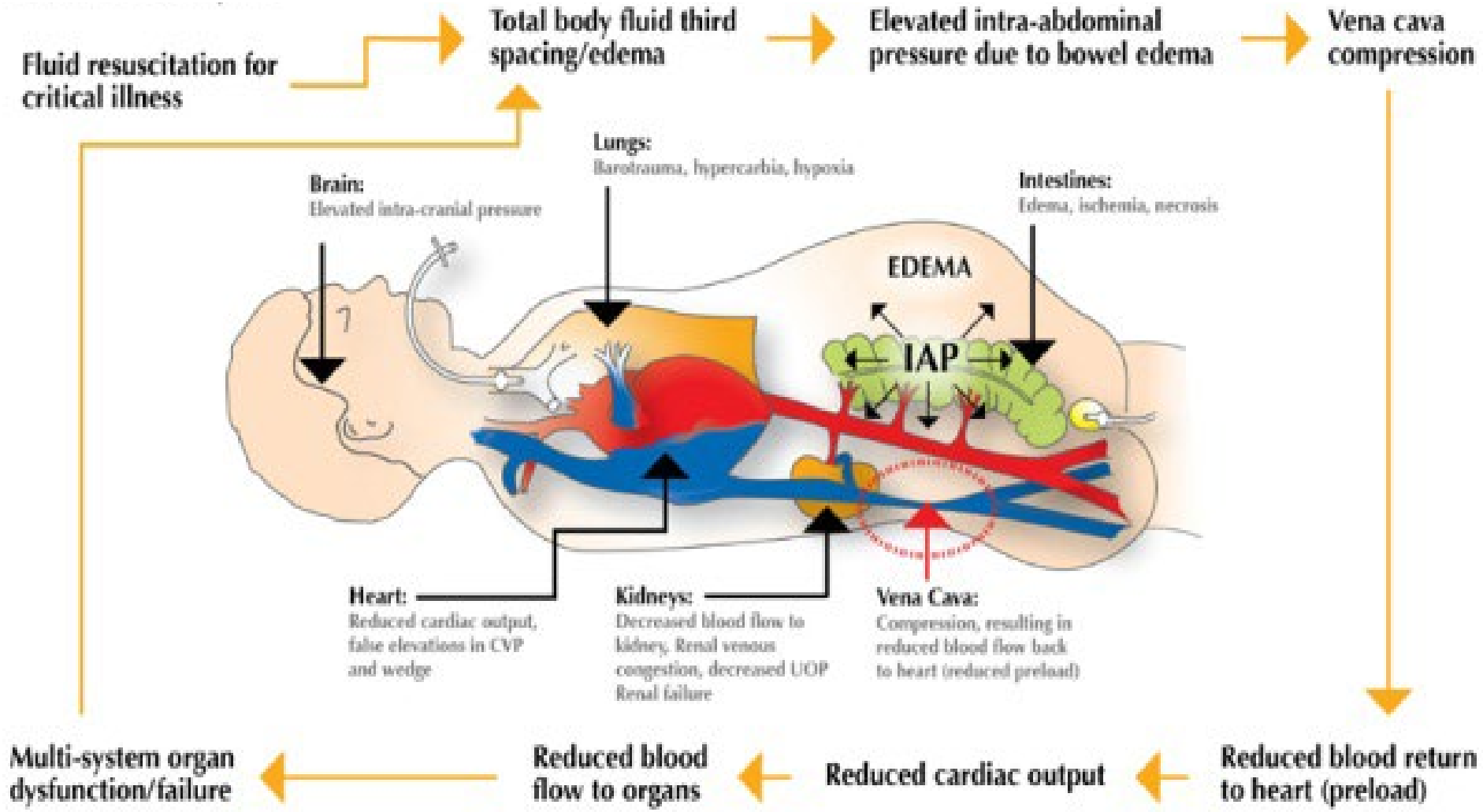
Primary Causes:

- Resuscitation edema
- Bowel edema
- Postoperative hemorrhage
- Bowel obstruction
- Closure of abdomen under tension
- Abdominal packing

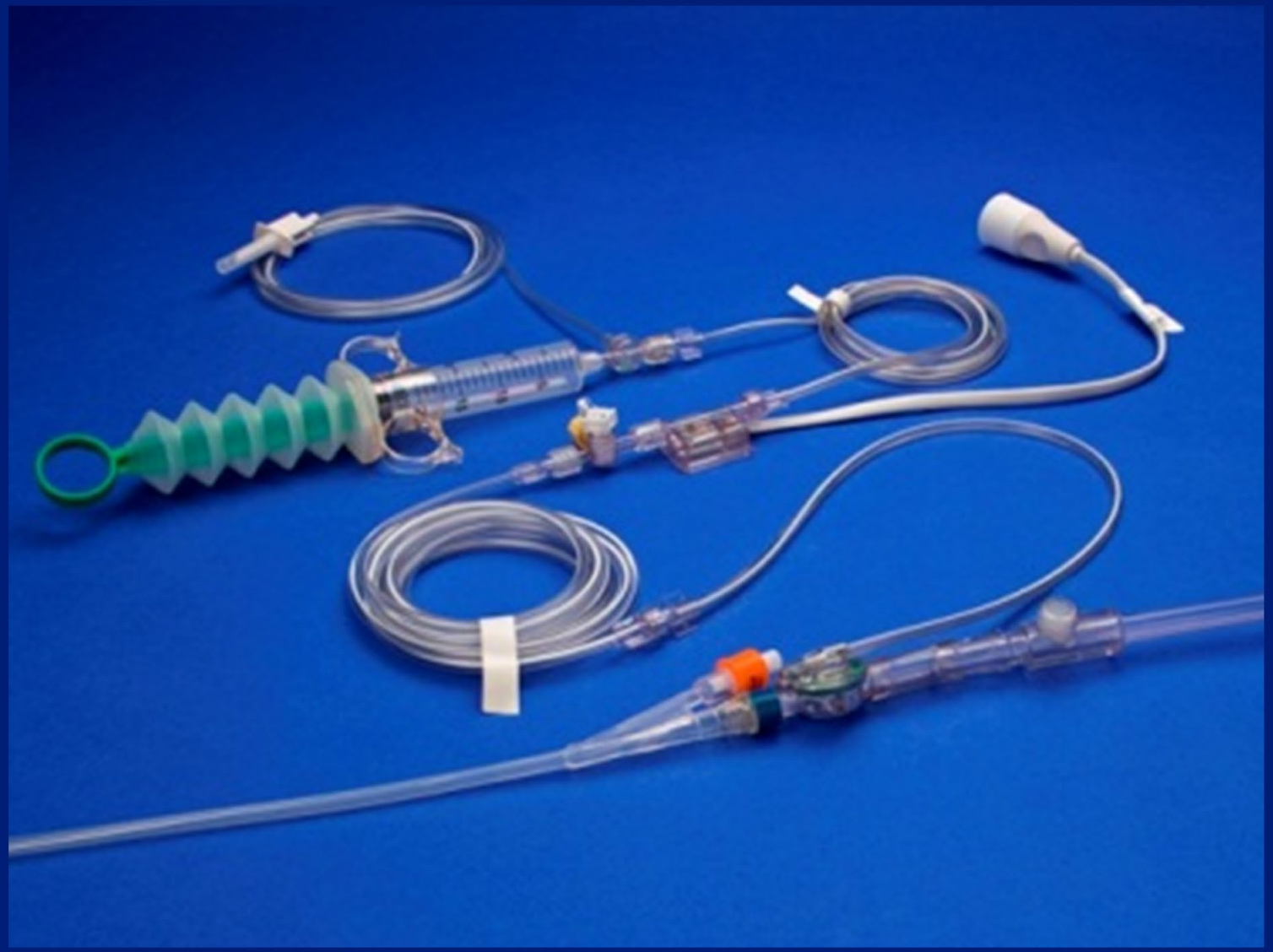


What Happens to the Body's Organs?

A Vicious Cycle



Abviser Courtesy of Wolfe Tory



Abviser Courtesy of Wolfe Tory

Reperfusion Phenomenon

- Decompression
  - Release of accumulated acids, metabolites (byproducts of anaerobic metabolism)
  - Profound cardiac depression and hypotension
- To blunt effects
  - 50 mEq Bicarb – up to 4 amps may be ordered
  - Volume resuscitation

Acute Acalculous Cholecystitis (AAC)

- Acute inflammation of gallbladder
- Masked by concomitant injuries and interventions
- Contributing factors include decreased oral intake, TPN, use of narcotics and gallbladder ischemia may occur due to hypotension
- Diagnosis assisted by US, elevated WBC
- Requires surgical intervention

Common Pitfalls

- Failure to suspect intra-abdominal injury from the mechanism of injury
- Failure to fully evaluate abdominal pain after sustaining blunt abdominal injury
- Failure to prepare patient for timely operative intervention
- Failure to recognize hemodynamic compromise and support delay of surgery for additional diagnostic testing

General Nursing Considerations

- Preparation of patient
- Current knowledge of resuscitation
- Administer blood and blood products as ordered
- Prevent hypothermia
- Ongoing monitoring of patients
- Monitor intake and output
- Evidenced-based practice

Summary

- Abdominal trauma presents challenges.
- Not all injuries are easy to diagnose.
- Not all diagnostic modalities are useful in certain injuries.
- Nursing staff must be astute in assessment skills and injury management.
- Teamwork is essential.
- Optimizing outcomes is important.