

Chapter 55

Approach to Abdominal Trauma in the ICU



55.1 Introduction

Abdominal trauma is a significant cause of morbidity and mortality worldwide, frequently leading to intensive care unit (ICU) admissions. The mechanisms of injury are diverse, encompassing blunt and penetrating trauma resulting from vehicle accidents, falls, sports injuries, assaults, domestic violence, and industrial accidents. In the United States, blunt abdominal trauma is more prevalent and often involves injuries to solid organs like the spleen, liver, and kidneys, as well as hollow viscera such as the intestines. Penetrating trauma, while less common, can be life-threatening and typically requires surgical intervention.

Epidemiological data indicate that abdominal trauma accounts for a substantial proportion of ICU admissions related to trauma, with high mortality rates, especially in cases involving multiple organ injuries or delayed diagnosis. The complexity of abdominal trauma is compounded by the risk of missed injuries and the subtlety of certain injury types, such as bowel and mesenteric injuries, which can complicate diagnosis and increase morbidity [1, 2] [Ref: Algorithm 55.1].

55.2 Initial Assessment

A prompt and structured approach to the initial assessment of abdominal trauma patients is critical. The Advanced Trauma Life Support (ATLS) guidelines recommend a systematic evaluation following the ABCDE (Airway, Breathing, Circulation, Disability, Exposure) protocol.

- **Airway:** Ensure airway patency while maintaining cervical spine precautions. Look for signs of airway obstruction or compromise.

- **Breathing:** Assess ventilation and oxygenation status. Identify signs of respiratory distress, tension pneumothorax, hemothorax, or other thoracic injuries that may accompany abdominal trauma.
- **Circulation:** Evaluate hemodynamic status by checking pulse rate, blood pressure, and capillary refill. Initiate rapid fluid resuscitation if hypotension is present. Recognize signs of shock and control any external bleeding sources. Source control of hemorrhage and replacement of blood volume is necessary to maintain circulation. Mechanical stabilization of the pelvic ring and external counterpressure are necessary to reduce volume loss in case of pelvic injury. Pelvic binder can be used to temporarily fix the unstable pelvis if applied at level of greater trochanters of the femur.
- **Disability:** Perform a rapid neurological assessment using the Glasgow Coma Scale (GCS) to identify any brain injury or decreased level of consciousness.
- **Exposure:** Fully expose the patient to assess for additional injuries while preventing hypothermia. This involves removing clothing and conducting a thorough head-to-toe examination. Temperature management is essential, as hypothermia can exacerbate coagulopathy and shock.

In addition to the primary survey, early assessment of biomarkers such as lactate levels can provide insight into tissue perfusion and the severity of internal injuries. Elevated lactate may indicate hypoperfusion and is associated with increased morbidity. Procalcitonin levels can be considered, especially when there is a high suspicion of bowel or mesenteric trauma, as elevated levels may suggest bacterial translocation or infection.

55.3 Focused Abdominal Assessment

A detailed abdominal examination is crucial in identifying signs of internal injury.

- **High-Risk Signs:** Recognize specific external markers that correlate with serious internal injuries. The “seatbelt sign” (bruising across the abdomen from a seatbelt) is associated with an increased risk of bowel and mesenteric injuries. Cullen’s sign (periumbilical ecchymosis) and Grey Turner’s sign (flank ecchymosis) suggest retroperitoneal bleeding or pancreatic injury and warrant immediate investigation.
- **Physical Examination:** Look for tenderness, guarding, rigidity, distension, or bruising. Auscultate for bowel sounds, noting any absence that may indicate ileus or peritonitis.
- **Dynamic Serial Examinations:** Due to the possibility of delayed presentation of certain injuries, serial abdominal examinations are invaluable. Repeated assessments can detect evolving signs of peritoneal irritation or hemodynamic instability, particularly in hollow viscus or mesenteric injuries that may not be apparent initially.

55.4 Imaging and Diagnostic Tools

Imaging plays a pivotal role in the evaluation of abdominal trauma.

- **E-FAST/eFAST (Extended Focused Assessment with Sonography for Trauma):** An extension of the traditional FAST exam, E-FAST includes the thoracic cavity to detect pneumothorax and hemothorax, which is crucial in polytrauma patients. While E-FAST is rapid and noninvasive, it has limitations in detecting hollow viscus injuries and retroperitoneal bleeding. In case of unavailability of eFAST, diagnostic peritoneal lavage may be done by surgeons in hemodynamically unstable patients or in patients with multiple puncture wounds.
- **Computed Tomography (CT) Scan:** Contrast-enhanced CT scanning is the gold standard for stable patients. It provides detailed visualization of solid organ injuries and vascular damage and can suggest hollow viscus injuries through findings like free air or fluid without solid organ injury.
- **Role of Repeat Imaging:** In cases where initial imaging is inconclusive or the patient's clinical status changes, repeat imaging is essential. Guidelines recommend that for equivocal findings, repeat CT scans should be performed within a specific time frame (e.g., within 6 hours) to reassess and detect any progression of injuries.
- **Limitations of Imaging:** Be aware that certain injuries may not be detected on initial imaging studies. Hence, a high index of suspicion and clinical correlation are necessary.

55.5 Management Strategies

Management of abdominal trauma requires a tailored approach based on the patient's hemodynamic status and injury severity.

- **Damage Control Surgery (DCS):** In unstable patients with life-threatening injuries, DCS focuses on controlling hemorrhage and contamination with abbreviated surgical procedures. Definitive repair is deferred until physiological stabilization is achieved. This approach reduces operative time and allows for correction of coagulopathy, hypothermia, and acidosis.
- **Nonoperative Management (NOM):** Hemodynamically stable patients without peritoneal signs or other indications for immediate surgery may be managed non-operatively. Criteria for NOM include stable vital signs, controlled bleeding, and absence of hollow viscus injury. Close monitoring in an ICU setting with predefined thresholds for surgical intervention is critical, as delayed deterioration can occur.
- **Angioembolization:** In select stable patients with solid organ injuries, angioembolization can control bleeding and preserve organ function. It is less invasive than laparotomy and can be an effective alternative, especially for injuries to the spleen, liver, or kidneys.

55.6 Specific Injuries and Management

- **Solid Organ Injuries:** Management depends on the grade of injury and hemodynamic status. For liver and spleen injuries, nonoperative management is preferred in stable patients. Transitioning to operative management is indicated for ongoing bleeding, hemodynamic instability, or failure of conservative measures.
- **Hollow Viscus Injuries:** These injuries are challenging to diagnose and have a high risk of being missed. Signs such as free intraperitoneal air on imaging, unexplained peritoneal fluid, or persistent abdominal pain should raise suspicion. Surgical exploration is recommended when conservative measures fail or if there is evidence of perforation or peritonitis.
- **Mesenteric Injuries:** Mesenteric tears may not cause significant bleeding initially but can lead to ischemia and necrosis of bowel segments if untreated. Indications for surgical exploration include signs of mesenteric hematoma, devascularization of bowel segments on imaging, or clinical signs of ischemia.

55.7 Monitoring and Follow-Up

- **Utilization of Biomarkers:** Serial measurements of biomarkers like procalcitonin can aid in monitoring patients managed non-operatively. Rising levels may indicate infection or the development of bowel injury, prompting reevaluation.
- **Importance of Reassessment:** Frequent clinical reassessment is crucial. Changes in vital signs, abdominal examination findings, or laboratory results should prompt reevaluation. Guidelines suggest regular observation intervals and repeat imaging as necessary.

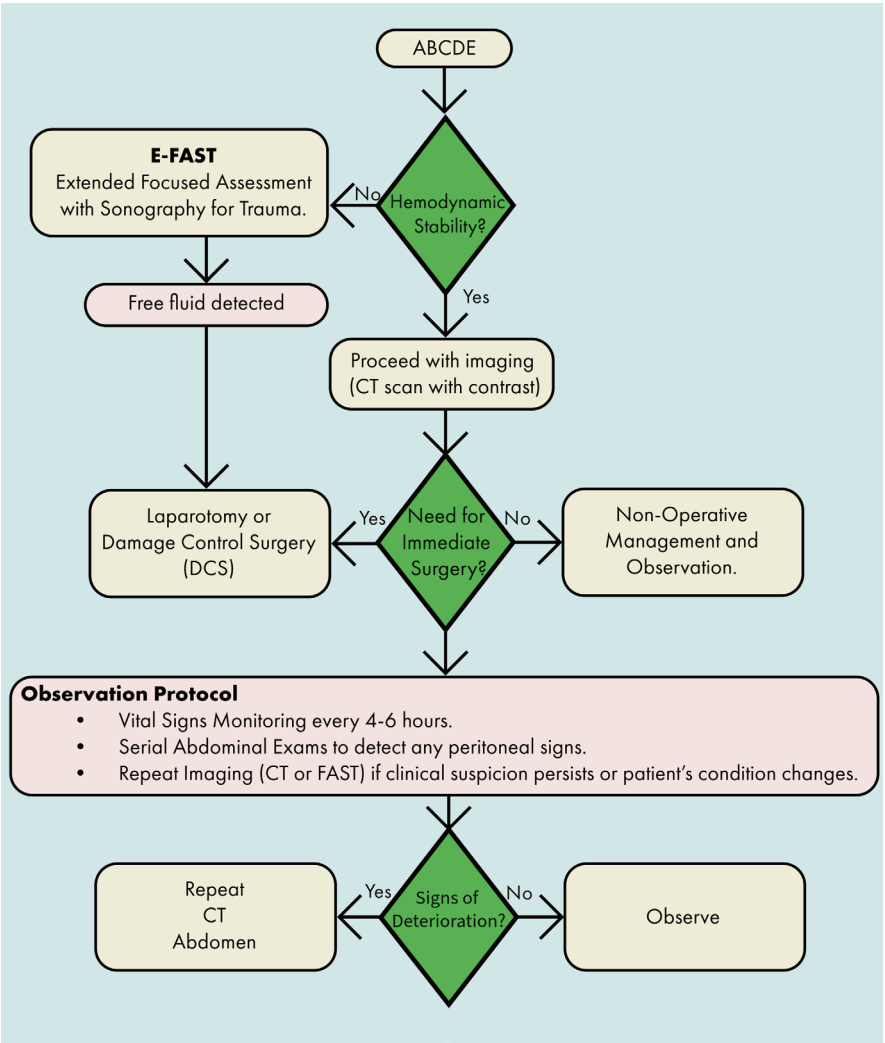
55.8 Complications and Prognosis

- **Infection Prevention:** There is a high risk of intra-abdominal infections, such as peritonitis and abscess formation, particularly with bowel injuries or delayed intervention. Early administration of appropriate antibiotics and close monitoring for signs of sepsis are essential components of management.
- **Long-Term Outcomes:** Despite advances in trauma care, patients with severe abdominal injuries face significant morbidity and mortality. Complications related to missed injuries, delayed interventions, and chronic conditions like adhesions, bowel obstruction, and postoperative infections can impact long-term outcomes.

55.9 Conclusion

Effective management of abdominal trauma in the ICU requires a structured, multi-disciplinary approach and adherence to established guidelines. Early recognition of injury patterns, prompt imaging, vigilant monitoring, and timely interventions are critical in reducing morbidity and mortality. By integrating clinical assessment with diagnostic tools and adopting individualized management strategies, healthcare providers can improve survival and outcomes for patients with abdominal trauma.

Algorithm 55.1: Approach to abdominal trauma in the ICU



Bibliography

1. American College of Surgeons. Advanced Trauma Life Support (ATLS): student course manual. 10th ed. Chicago: American College of Surgeons; 2018.
2. Smyth L, Bendinelli C, Lee N, Reeds MG, Loh EJ, Amico F, et al. WSES guidelines on blunt and penetrating bowel injury: diagnosis, investigations, and treatment. *World J Emerg Surg.* 2022;17(1):13.