IN THE NAME OF GOD

Thoracic Trauma

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- Many causes of early deaths (within the first 30 to 180 minutes) resulting from thoracic trauma are preventable and include tension pneumothorax, cardiac tamponade, airway obstruction, and uncontrolled hemorrhage

NEXUS-Chest Computed Tomography Criteria for Chest Computed Tomography After Blunt Trauma

Abnormal chest x-ray
Rapid deceleration mechanism (defined as fall >20 feet or motor vehicle collision >40 mph)
Distracting painful injury
Chest wall tenderness
Sternal tenderness
Thoracic spine tenderness
Scapular tenderness

RIB FRACTURE

- The susceptibility to rib fracture increases with age.
- Can be exquisitely painful, but their importance lies not in the fracture itself, which generally is self-limiting and will heal, but rather associated complications, particularly pneumothorax, hemothorax, pulmonary contusions, and post-traumatic pneumonia.

- Ribs usually break at the point of impact or at the posterior angle or posterolateral area, which is structurally the weakest area.
- The 4th through 9th ribs are most commonly involved.
- Ribs 1 to 3 are short and relatively protected, and ribs 9 to 12 are longer and more mobile at the anterior end.
- This confers the relative resistance to fracture of the “high” and “low” ribs.

- Rib fracture is often a clinical diagnosis, with severe point tenderness, bony crepitus, ecchymosis, and muscle spasm over the rib

Management

- Respiratory decompensation is the primary indication for endotracheal intubation and mechanical ventilation for patients with multiple rib fractures.

- In the awake and cooperative patient, noninvasive continuous positive airway pressure (CPAP) by mask may obviate the need for intubation

- Adequate pain relief and the maintenance of pulmonary function
- oxygen should be administered
- cardiac and oximetry monitors applied
- patient observed for signs of an associated injury, such as tension pneumothorax.

- Hospitalization should be considered for patients with three or more fractured ribs

- Elderly patients with six or more fractured ribs should be treated in intensive care units owing to high morbidity and mortality

PULMONARY CONTUSION AND LACERATION

- Pulmonary contusion is reported to be present up to 75% of patients with significant blunt chest trauma, most often from MVCs with rapid deceleration

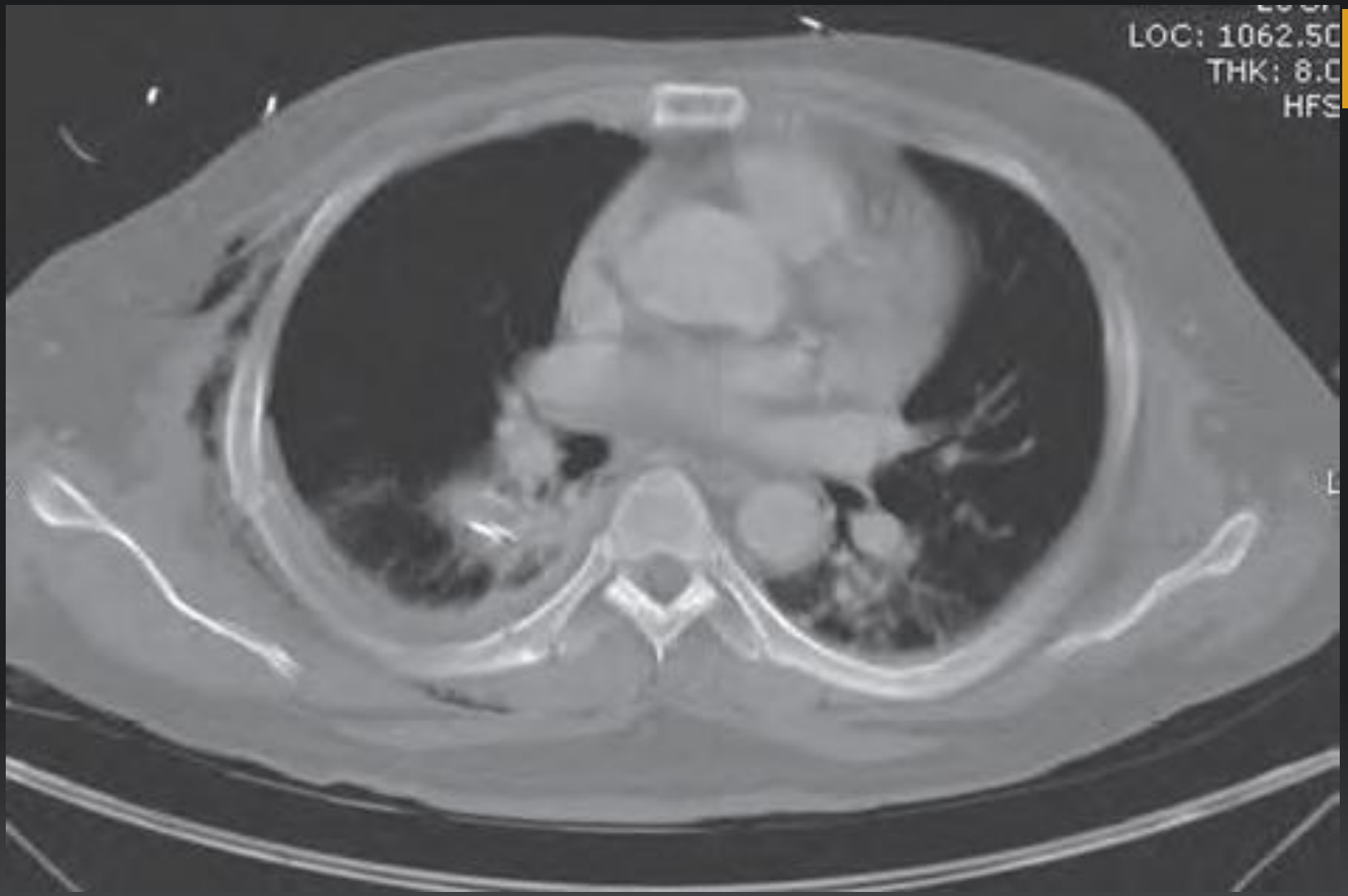
The clinical manifestations include:

dyspnea, tachypnea, cyanosis, tachycardia, hypotension, and chest wall bruising

- Typical radiographic findings can begin to appear within minutes of injury and range from patchy, irregular, alveolar infiltrate to frank consolidation

They are almost always present within 6 hours.

The rapidity of changes on chest x-ray visualizationusually correlates with the severity of the contusion or laceration.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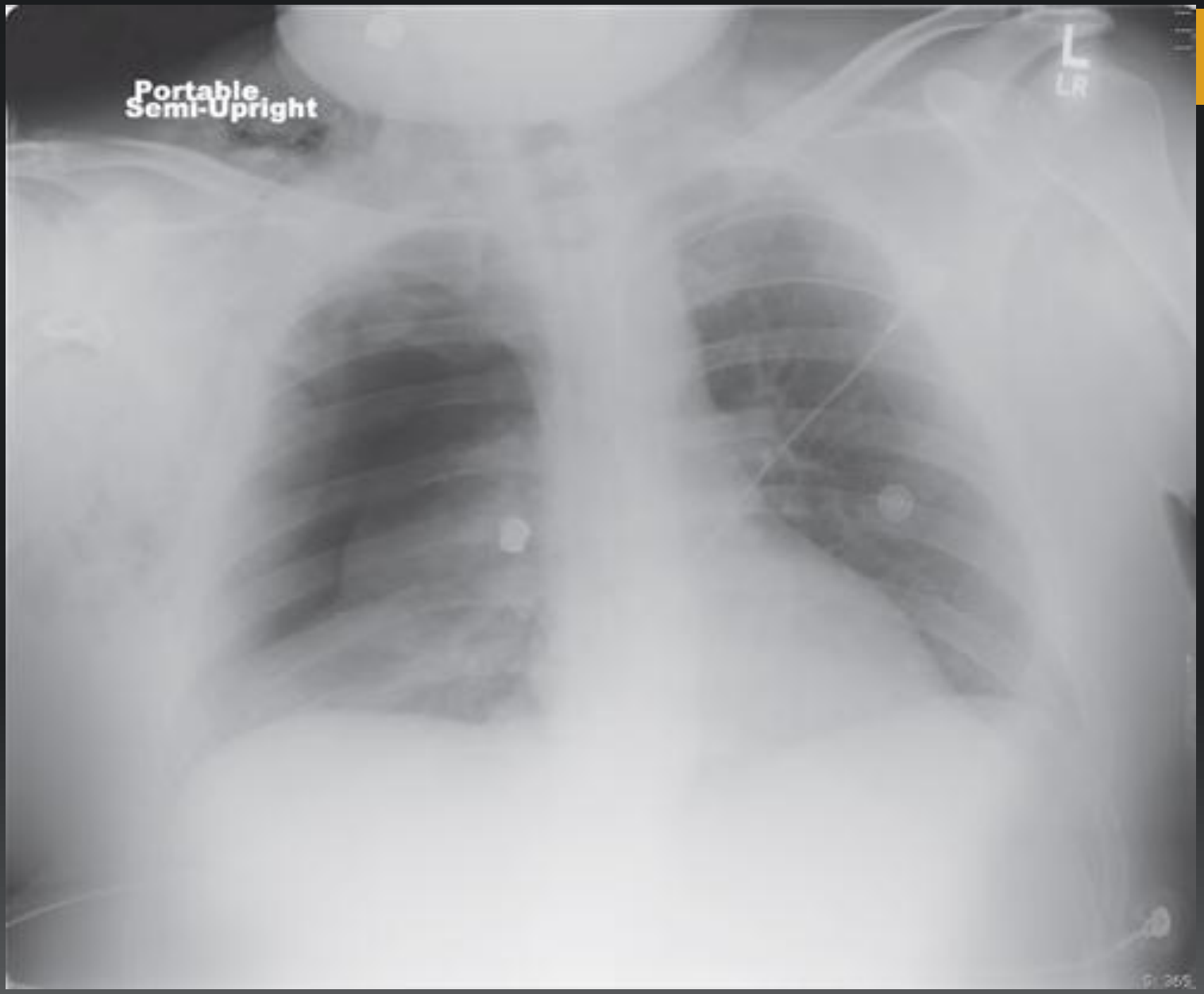
- Treatment for pulmonary contusion: supportive
- intubation and mechanical ventilation should be avoided if possible, because they are associated with an increase in morbidity, including pneumonia, sepsis, pneumothorax, hypercoagulability, and longer hospitalization
- dual-lumen endotracheal tube and two ventilators

- Restriction of intravenous (IV) fluids (to maintain intravascular volume within strict limits) and comprehensive supportive care consisting of vigorous tracheobronchial toilet, suctioning, and pain relief

PNEUMOTHORAX

- The accumulation of air in the pleural space

- Shortness of breath
- chest pain
- Acutely ill with cyanosis and tachypnea to misleadingly healthy.
- The signs and symptoms are not always correlated with the degree of pneumothorax.
- Decreased or absent breath sounds
- hyper-resonance over the involved side as well as subcutaneous emphysema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L
LR

Indications for Tube Thoracostomy

- Traumatic cause of pneumothorax (except asymptomatic, apical pneumothorax)
- Moderate to large pneumothorax
- Respiratory symptoms regardless of size of pneumothorax
- Increasing size of pneumothorax after initial conservative therapy
- Recurrence of pneumothorax after removal of an initial chest tube
- Patient requires ventilator support
- Patient requires general anesthesia
- Associated hemothorax
- Bilateral pneumothorax regardless of size
- Tension pneumothorax

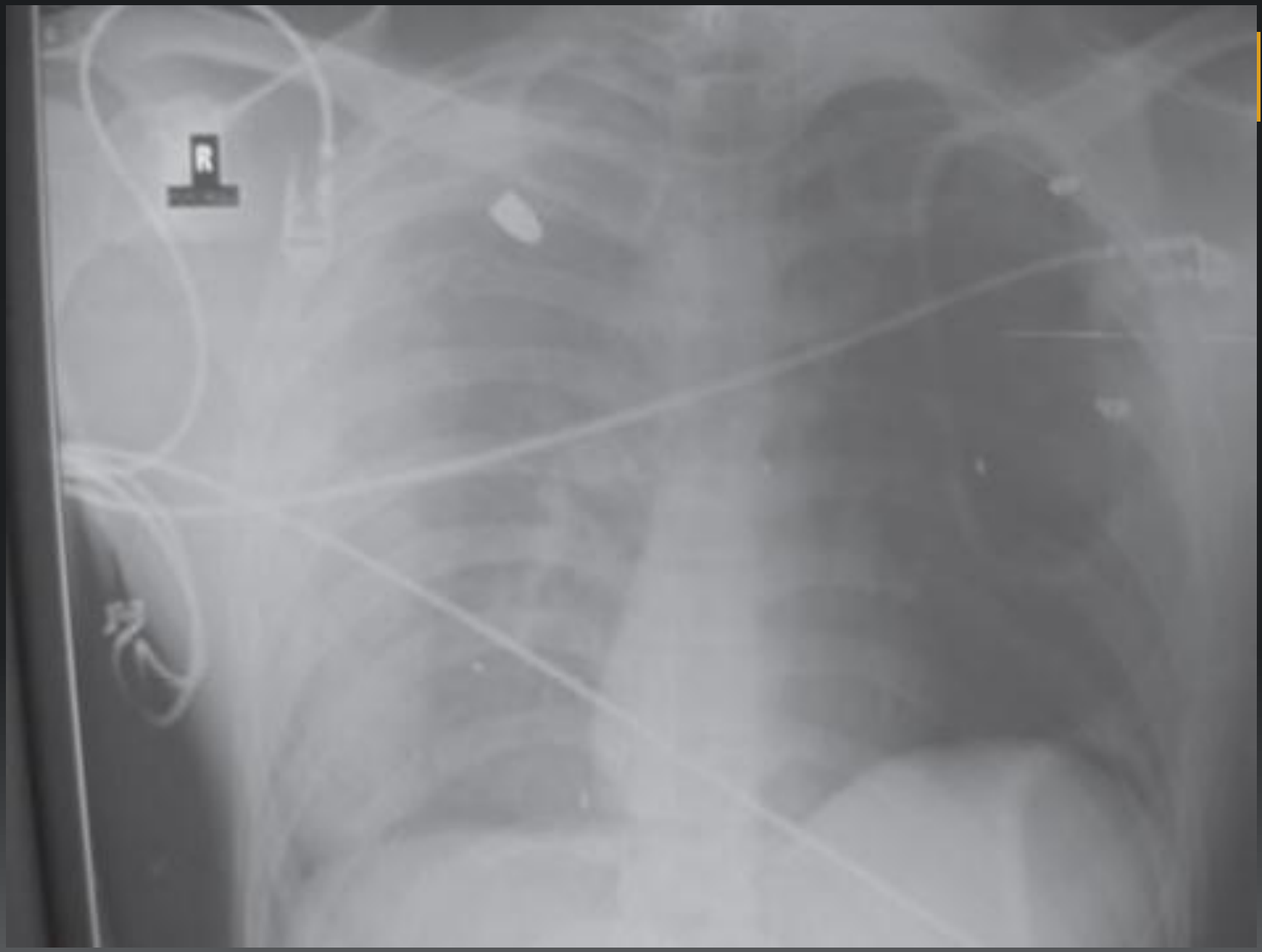
Tension pneumothorax become acutely ill within minutes and develop severe cardiovascular and respiratory distress.

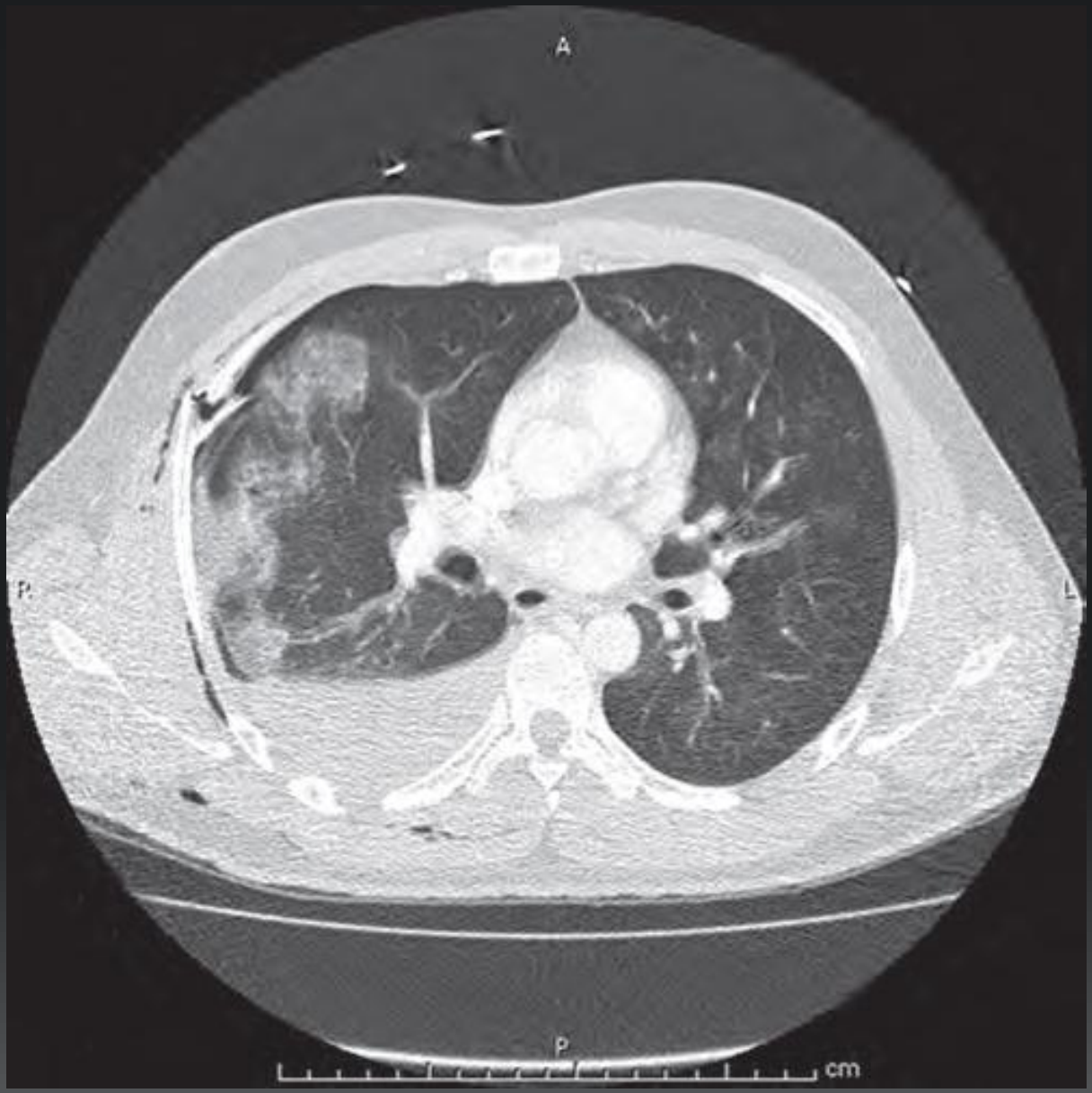
- They are dyspneic, agitated, restless, cyanotic, tachycardic, and hypotensive and display decreasing mental activity.
- Tachycardia, hypotension, oxyhemoglobin desaturation, jugular venous distention (JVD), and absent breath sounds on the ipsilateral side.
- JVD may not reliably be present with massive blood loss.

- When the diagnosis of tension pneumothorax is suspected clinically,
- Needle thoracostomy, which is performed by inserting a large-bore (14- gauge or larger) catheter, at least 5 cm in length, through the fourth or fifth interspace laterally or the second or third interspace anteriorly on the involved side

HEMOTHORAX

- The accumulation of blood in the pleural space after blunt or penetrating chest trauma
- may produce hypovolemic shock and dangerouslyreduce vital capacity.




A
P
cm

- Treatment of hemothorax consists of restoring the circulating blood volume, controlling the airway as necessary, evacuating the accumulated blood.

- A large-bore tube (36-F to 40-F)

should be inserted in the fifth interspace at the anterior axillary line and connected to underwater seal drainage and suction (20 to 30 mL H2O).

Indications for Thoracotomy

- Initial thoracostomy tube drainage is more than 20 mL of blood per kilogram.
- Persistent bleeding at a rate greater than 7 mL/kg/hr is present.
- Increasing hemothorax seen on chest x-ray films.
- Patient remains hypotensive despite adequate blood replacement, and other sites of blood loss have been ruled out.
- Patient decompensates after initial response to resuscitation.

Abdominal Trauma

- Wounds from stabbing implements occur nearly three times more often than from firearms, but the latter are responsible for 90% of penetrating trauma mortality
- The small intestine, colon, and liver are the most likely organs to sustain injury after penetrating trauma.

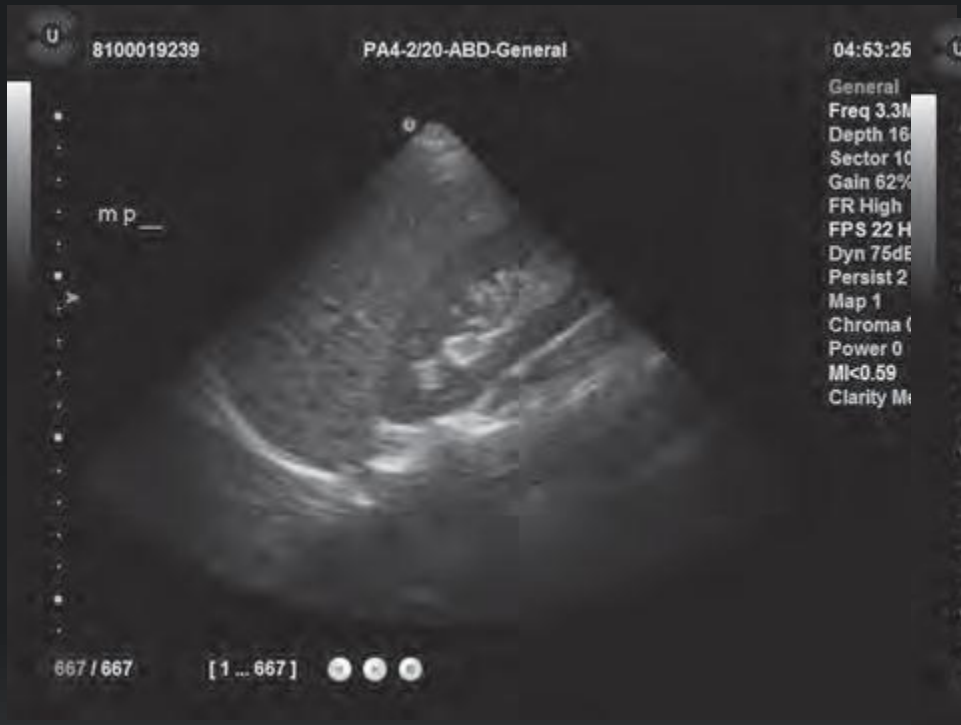
- Despite advances in imaging, blunt injuries carry a greater risk of mortality than penetrating injuries because they are more difficult to diagnose and are commonly associated with severe trauma to multiple intraperitoneal organs and extra-abdominal systems.

- The spleen is the organ most often injured; and in nearly two thirds of these cases, it is the only damaged intraperitoneal structure.

- The liver is the second most commonly injured intraabdominal organ,

Ultrasonography

- Extended focused assessment with sonography for trauma (E-FAST) examination is indicated in all poly-trauma patients and all patients with suspected abdominal injury, whether by blunt or penetrating mechanism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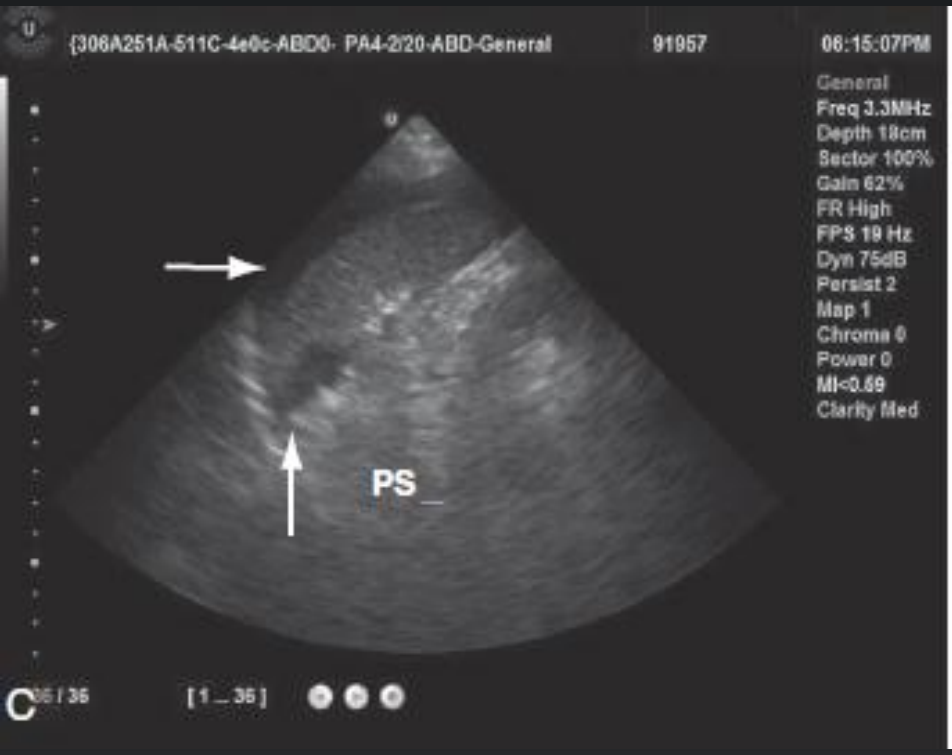
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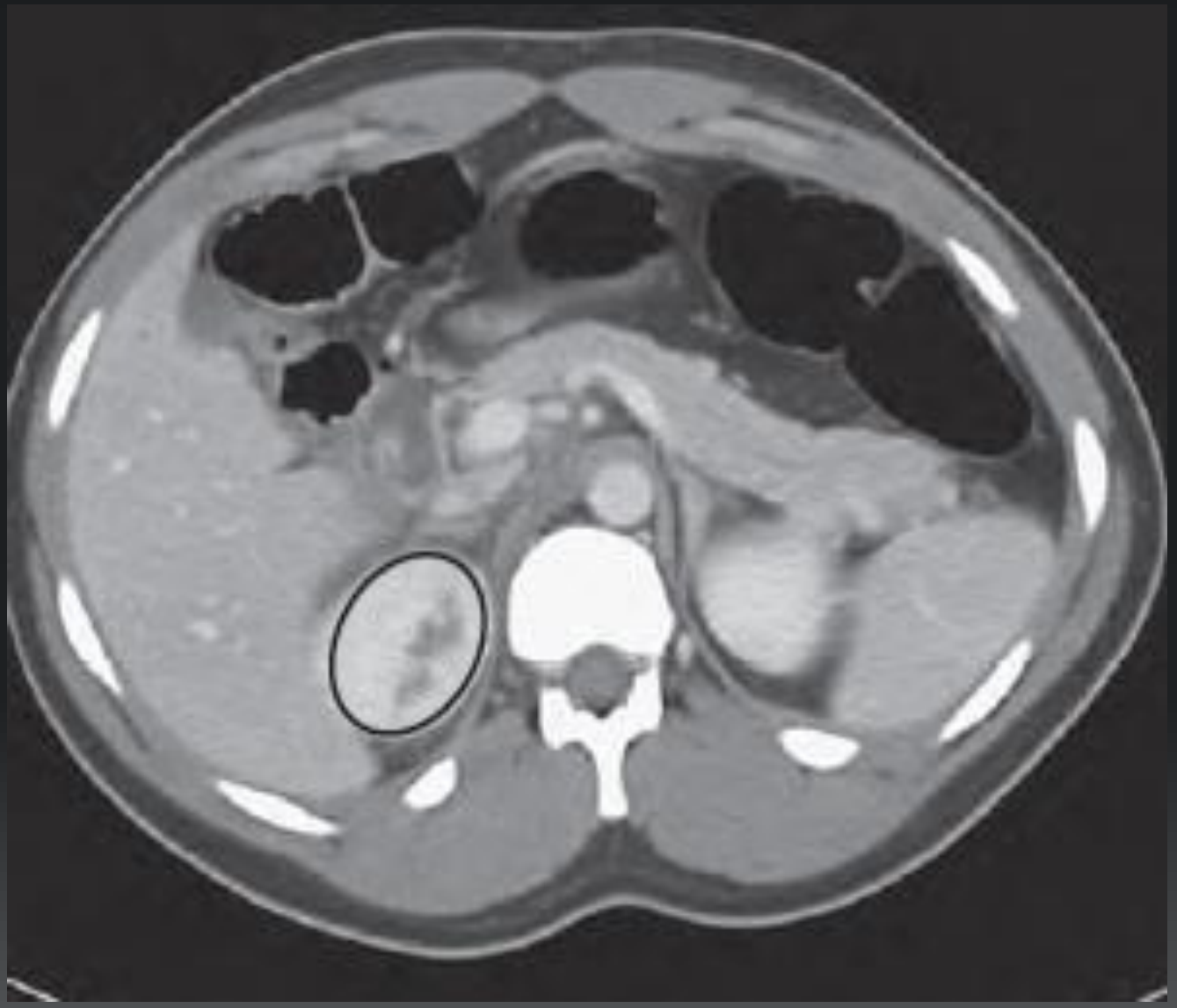
D

- CT scanning can define the injured organ and the extent of the injury.
- It is most accurate for solid visceral lesions and discerns the presence, source, and approximate quantity of intraperitoneal hemorrhage, active bleeding from the liver or spleen
- Can be used to determine whether observation, therapeutic angiographic embolization, or open operative intervention is indicated.



MANAGEMENT

- In patients who are intubated, have a massively distended abdomen, or in whom there is a high concern for stomach or duodenal injury, a nasogastric tube should be placed to decompress the abdomen, decrease the likelihood of aspiration, and determine whether blood is present, respectively.
- Placement of an orogastric tube is preferable in patients with midface or skull base fractures.

- Foley catheterization, once fairly routine, is reserved for unconscious patients, and those in shock, for whom urine output is an indicator of adequate end-organ perfusion

- Intestinal perforation and soiling can occur with penetrating, and less commonly with blunt, trauma to the abdomen.
- A single preoperative dose of a broad-spectrum antibiotic or combination of antibiotics that covers both aerobic and anaerobic organisms, such as piperacillin-tazobactam 3.375 g intravenously

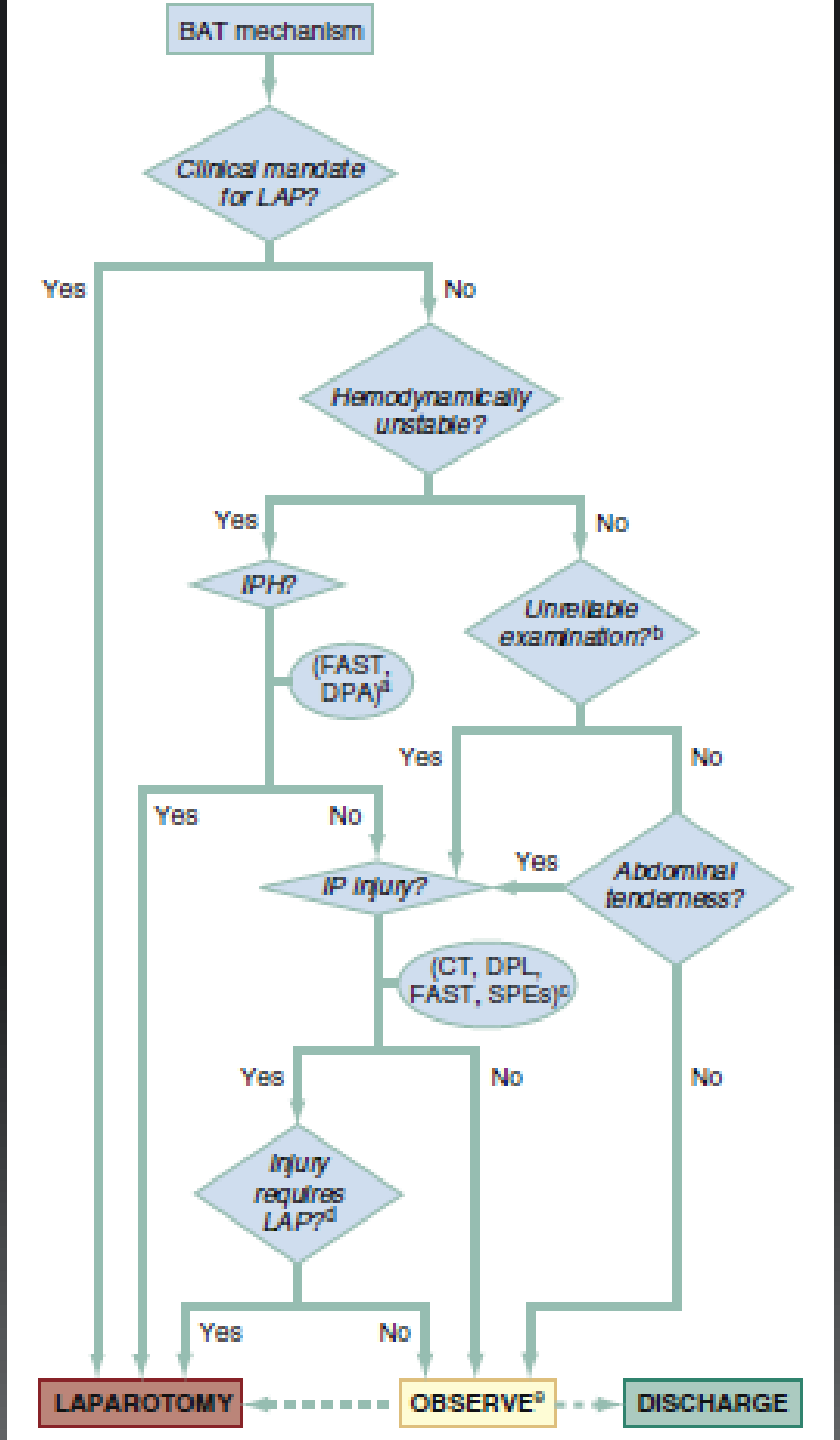

BAT mechanism
Clinical mandate for LAP?
Yes
No
Hemodynamically unstable?
Yes
No
IPH?
Unreliable examination?[b]
(FAST, DPA)[a]
Yes
No
Yes
No
Yes
IP injury?
Abdominal tenderness?
(CT, DPL, FAST, SPEs)[c]
Yes
No
No
Injury requires LAP?[d]
Yes
No
LAPAROTOMY
OBSERVE[e]
DISCHARGE

TABLE 38.2 Clinical Indications for Laparotomy After Blunt Trauma

Manifestation	Pitfall
Unstable vital signs with strongly suspected abdominal injury	Alternate sources of shock
Unequivocal peritoneal irritation	Potentially unreliable
Pneumoperitoneum	Insensitive; may be caused by cardiopulmonary source or invasive procedures (diagnostic peritoneal lavage, laparoscopy)
Evidence of diaphragmatic injury	Nonspecific and insensitive, especially in penetrating trauma
Significant gastrointestinal bleeding	Uncommon, unknown accuracy

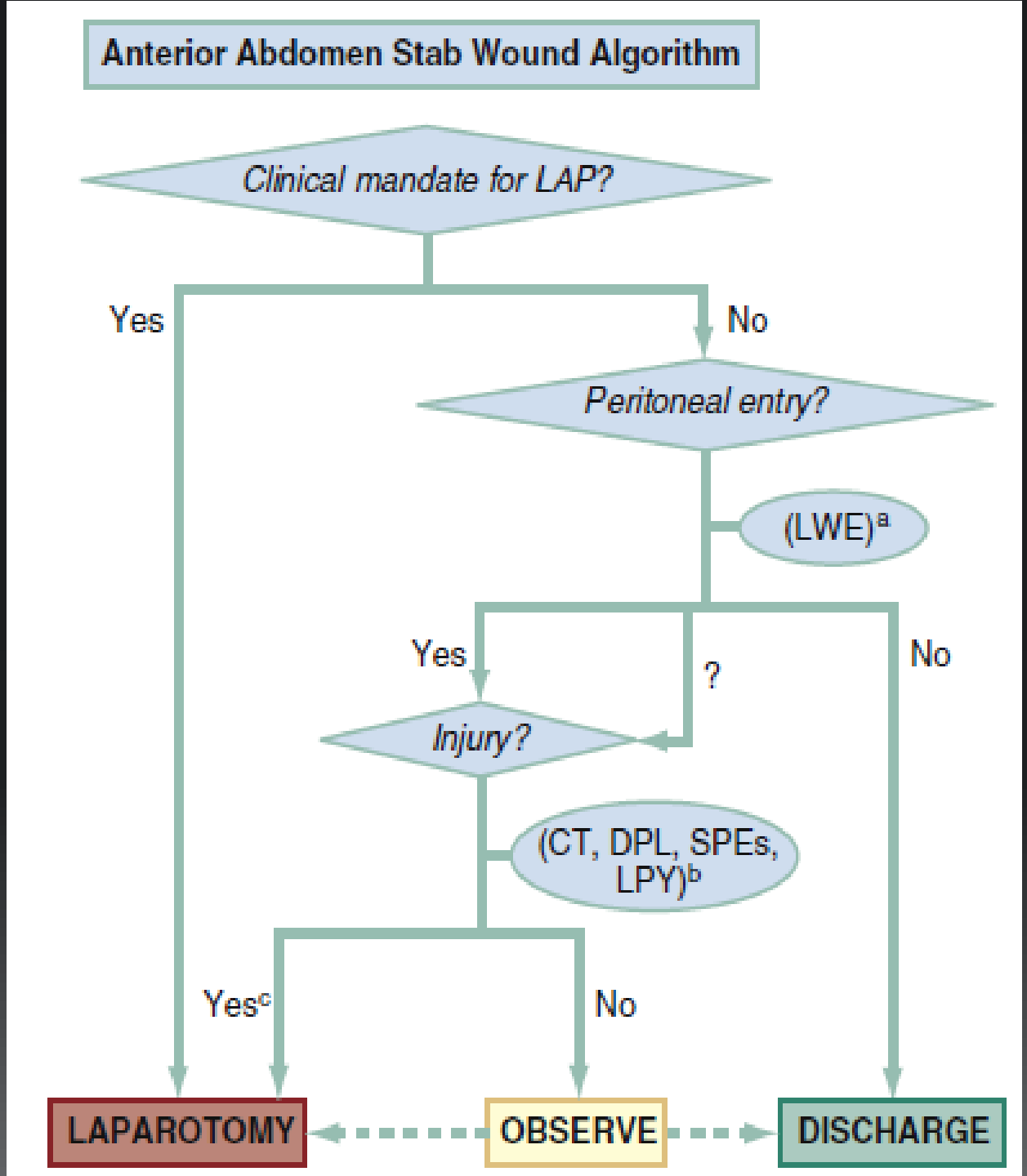

Anterior Abdomen Stab Wound Algorithm
Clinical mandate for LAP?
Yes
No
Peritoneal entry?
(LWE)a
Yes
?
No
Injury?
(CT, DPL, SPEs, LPY)b
Yesc
No
LAPAROTOMY
OBSERVE
DISCHARGE

TABLE 38.1 Clinical Indications for Laparotomy Following Penetrating Trauma

Manifestation	Premise	Pitfall
Emergent Laparotomy Indicated		
Hemodynamic instability	Major solid visceral or vascular injury	Thorax, mediastinum, pelvic, or long bone sources; abdominal injuries causal or contributory
Peritoneal signs	Intraperitoneal injury	Unreliable, especially immediately post injury
Evisceration	Additional bowel or other injury	No injury in up to one third of stab wound cases
Diaphragmatic injury	Diaphragm	Rare clinical, radiographic findings unreliable
Laparotomy Requires Additional Clinical Evidence		
Gastrointestinal hemorrhage	Proximal gut	Uncommon, unknown accuracy
Implement in situ	Vascular impalement	Comorbid disease or pregnancy creates high operative risk
Intraperitoneal air	Hollow viscus perforation	Insensitive; may be caused by intraperitoneal entry only or may have cardiopulmonary source

THANK YOU