

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



LAPAROSCOPY FOR ABDOMINAL TRAUMA

Dr. BehnamReza Makhsoosi

History

Laparoscopy (from Ancient Greek *λαπάρα* (*lapara*) 'flank, side', and *σκοπέω* (*skopeo*) 'to see') is an operation performed in the abdomen or pelvis using small incisions (usually 0.5–1.5 cm) with the aid of a camera. The laparoscope aids diagnosis or therapeutic interventions with a few small cuts in the abdomen.^[1]

Laparoscopic surgery, also called minimally invasive surgery (MIS), *bandaid surgery*, or *keyhole surgery*, is a modern surgical technique. There are a number of advantages to the patient with laparoscopic surgery versus an exploratory laparotomy. These include reduced pain due to smaller incisions, reduced hemorrhaging, and shorter recovery time. The key element is the use of a **laparoscope**, a long fiber optic cable system that allows viewing of the affected area by snaking the cable from a more distant, but more easily accessible location.

Laparoscopic surgery includes operations within the abdominal or pelvic cavities, whereas keyhole surgery performed on the thoracic or chest cavity is called thoracoscopic surgery. Specific surgical instruments used in laparoscopic surgery include obstetrical forceps, scissors, probes, dissectors, hooks, and retractors. Laparoscopic and thoracoscopic surgery belong to the broader field of endoscopy. The first laparoscopic procedure was performed by German surgeon Georg Kelling in 1901.



Outline

Diagnostic Laparoscope

- Technique
- Indication
- Contraindications
- Risks
- Benefits
- Accuracy
- Complications
- Cost effectiveness

Therapeutic

- Solid organ
- Hollow viscus
- Diaphragmatic Injury

Types of the abdominal trauma

- Blunt abdominal trauma.
- Penetrating abdominal trauma



Blunt
trauma



Diagnostic Laparoscopy for Trauma

- Exploratory laparotomies in trauma patients with suspected intra-abdominal injuries are associated with a high negative laparotomy rate and significant procedure-related morbidity.



However

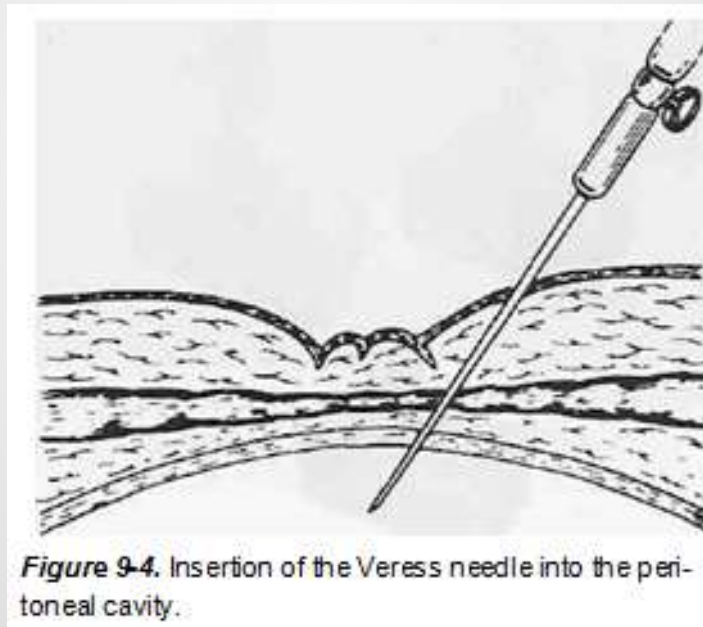
- Diagnostic laparoscopy has been proposed for trauma patients to prevent unnecessary exploratory laparotomies with their associated higher morbidity and cost.

Technique

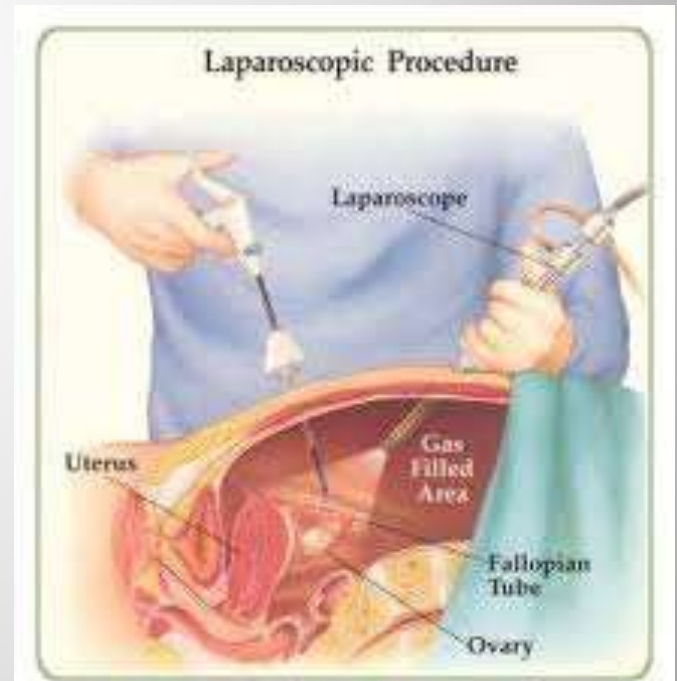
- Usually performed under general anesthesia
- Local anesthesia with IV sedation has also been used successfully. BUT in conjunction with a dedicated mobile cart, facilitates the procedure in the ED.

- Low insufflation pressures (8-12 mm Hg); however, pressures up to 15 mm Hg have been described without untoward events.
- Special attention should be given to the possibility of a tension pneumothorax caused by the pneumoperitoneum due to an unsuspected diaphragmatic rupture

- The pneumoperitoneum is created usually through a periumbilical incision using a Veress needle or open technique after insertion of a nasogastric tube and a Foley catheter.



- A 30-degree laparoscope is advantageous, and additional trocars are used for organ manipulations. The peritoneal cavity can be examined systematically taking advantage of patient positioning manipulations.



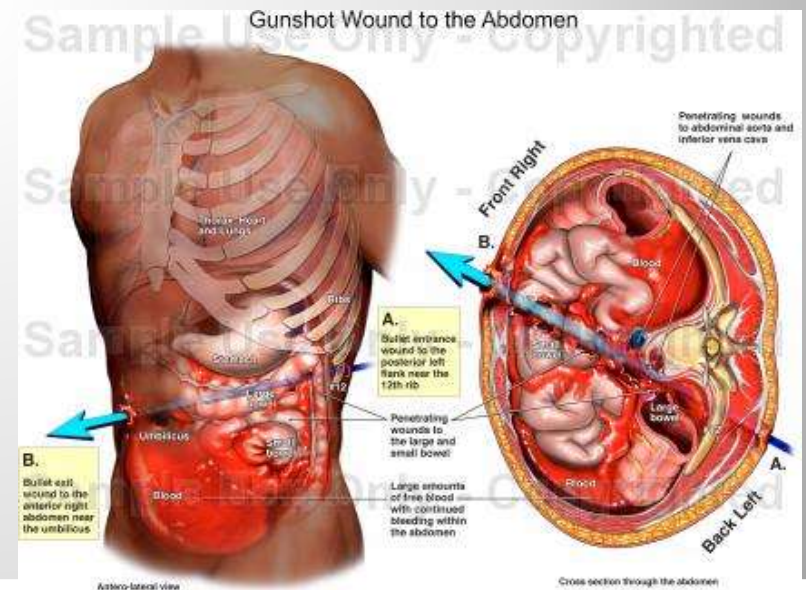
- The colon can be mobilized and the lesser sac inspected.
- Suction/irrigation may be needed for optimal visualization, and methylene blue can be administered IV or via a nasogastric tube to help identify urologic or stomach injuries, respectively.
- In penetrating injuries, peritoneal violation can be determined.

Indications

- Suspected but unproven intra-abdominal injury after blunt or penetrating trauma
- Suspected intra-abdominal injury despite negative initial workup after blunt trauma
- Abdominal stab wounds with proven or equivocal penetration of fascia

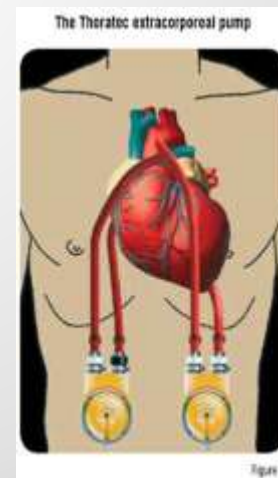


- Abdominal gunshot wounds with doubtful intraperitoneal trajectory
- Diagnosis of diaphragmatic injury from penetrating trauma to the thoracoabdominal area
- Creation of a transdiaphragmatic pericardial window to rule out cardiac injury



Contraindications (Absolute or Relative)

- Hemodynamic instability (systolic pressure < 90 mm Hg)
- A clear indication for immediate celiotomy such as frank peritonitis, hemorrhagic shock, or evisceration



- Known or obvious intra-abdominal injury
- Posterior penetrating trauma with high likelihood of bowel injury
- Limited laparoscopic expertise



- Delay to definitive treatment
- Missed injuries with their associated morbidity
- Procedure- and anesthesia-related complications

Risks

- Reduction in the rate of negative and non therapeutic laparotomies (with a subsequent decrease in hospitalization, morbidity, and cost after negative laparoscopy)
- Accurate identification of diaphragmatic injury
- Ability to provide therapeutic intervention

Benefits

- The sensitivity, specificity, and diagnostic accuracy of the procedure when used to predict the need for laparotomy are high (75-100%) (level I-III)

Diagnostic Accuracy of the Procedure

Intraoperative complications can occur during

- creation of the pneumoperitoneum
- trocar insertion
- during the diagnostic examination

These complications include:

- tension pneumothorax caused by unrecognized injuries to the diaphragm
- perforation of a hollow viscus
- laceration of a solid organ
- vascular injury (usually trocar injury of an epigastric artery or lacerated omental vessels)
- subcutaneous or extraperitoneal dissection by the insufflation gas.
- Port site infections may occur during the postoperative course.

- In a very recent study, awake laparoscopy in the emergency department under local anesthesia resulted in discharge of patients from the hospital faster compared with DL in the operating room (7 vs. 18 hours, respectively; $p < 0.001$) (level III) .

- Diagnostic laparoscopy is technically feasible and can be applied safely in appropriately selected trauma patients (grade B).
- The procedure has been shown to effectively decrease the rate of negative laparotomies and minimize patient morbidity.



Recommendations

- It should be considered **in hemodynamically stable blunt trauma patients** with suspected intra-abdominal injury and equivocal findings on imaging studies or even in patients with negative studies but a high clinical likelihood for intra-abdominal injury (grade C)

- It may be particularly useful and should be considered in patients with **penetrating trauma of the abdomen with documented or equivocal penetration** of the anterior fascia (grade C).

- It should be used in patients with suspected **diaphragmatic injury**, as imaging occult injury rates are significant, and DL offers the best diagnostic accuracy (grade C).

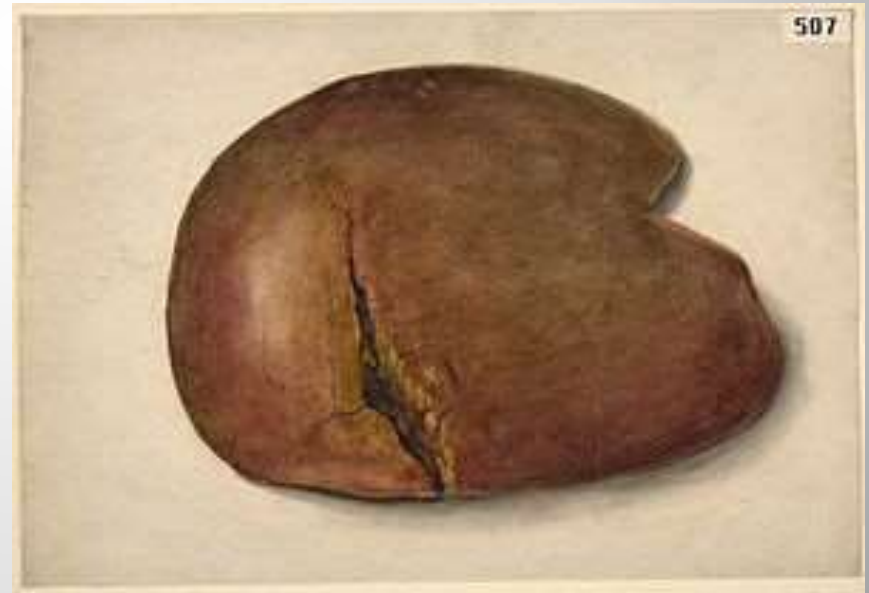


- The use of therapeutic laparoscopy remains controversial, with the majority of the literature compromising case reports or series. Laparoscopic repair of perforating injuries to the diaphragm represents the most frequently described therapeutic application .

Therapeutic laparoscopy

- Therapeutic intervention can be provided safely when laparoscopic expertise is available (grade C).
- To optimize results, the procedure should be incorporated in institutional diagnostic and treatment algorithms for trauma patients.

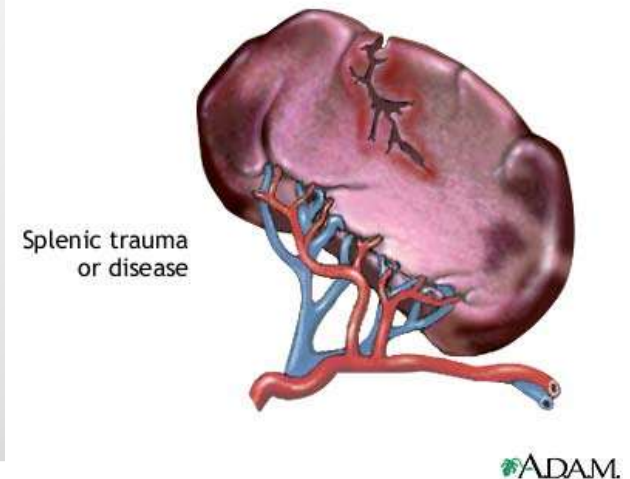
- but there are increasing reports of laparoscopic haemostasis of minor injuries to the liver or spleen
- therapeutic use of laparoscopy to repair limited gastrointestinal injuries .



- Some surgeons advocate interval washout of intra-peritoneal blood or bile following visceral injury to decrease ileus and peritoneal symptoms, transfusion .

- Laparoscopic repairs of injuries to virtually every organ have been described. Injuries to diaphragm (Simon)
- parenchymal organs and gastro-intestinal tract (Cherkasov, Lin) have been successfully repaired laparoscopically.
- Large case series exist from institutions that provide full definitive laparoscopic management of any injuries (also in shocked and actively bleeding patients) with no or minimal missed injuries and dismal conversion rate (Cherkasov, Lin).

- Actively bleeding spleen injuries may be treated laparoscopically. Patients who continue to bleed following embolization or with high grade spleen injuries are treated with laparoscopic application of collagen–fibrinogen human thrombin seal on oozing lacerations and if a major bleeding is encountered laparoscopic splenectomy is then performed (Olmi,Marzano).



- Non-operative management of hepatic and splenic injuries is successful in up to 80% of instances. Many of these patients (up to 75% in high grade injuries) will demonstrate signs of inflammatory response due to the haemoperitoneum (fever, leukocytosis, discomfort, and tachycardia) (Letoublon).

- During the procedure the solid organs and the clots on their surface are left alone to avoid any potential haemorrhage. Bilioma and biliary peritonitis due to bile duct injuries may also be treated with collagen–fibrinogen human thrombin seal and/or drained laparoscopically. (Carillo Sugrue, Marzano).

- Small lacerations of stomach, duodenum, small bowel, and colon can be repaired laparoscopically. When an anastomosis or a long repair is required these are usually performed extracorporeally through a small focused celiotomy (Hope Streck, Iannelli).

Laparoscopic contraindications are present in 30% of patients.

**Skull
pressure**

**Recent
surgery**

**Cardio
Vascular**

Sepsis

Unstable

Negative Laparotomy

Nearly 40% of Stable trauma patients undergo surgery due to DPL or other diagnostic modalities; They do not have a positive point in the examination and exploration of laparotomy.

Twenty-five percent of patients who undergo laparotomy due to trauma can be treated retrograde with laparoscopic procedures or even conservative treatments.

70% of Thoraco-Abdominal traumas will not require laparotomy or serious intervention.

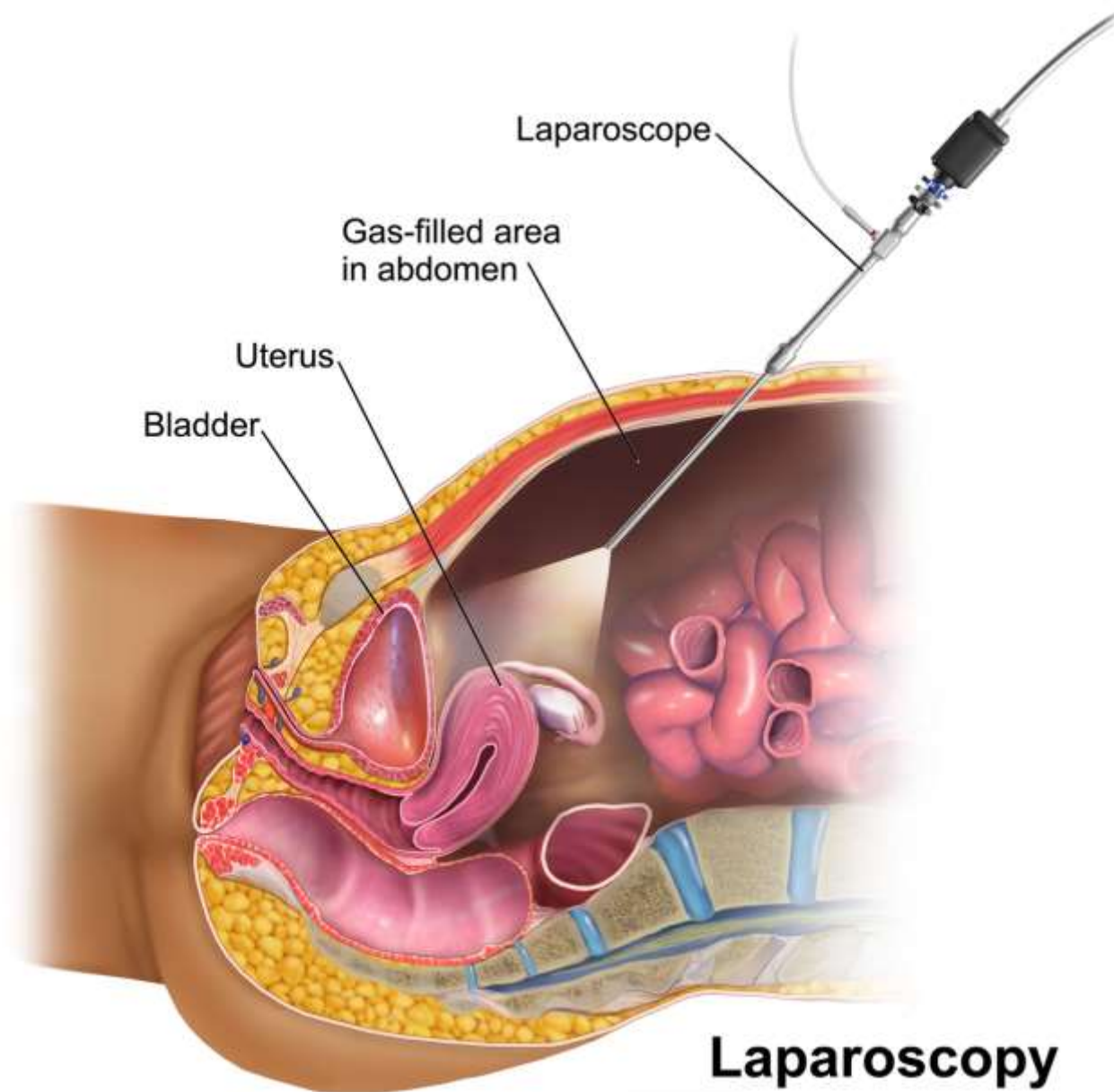
Reduction of Negative Laparotomy by Laparoscopy

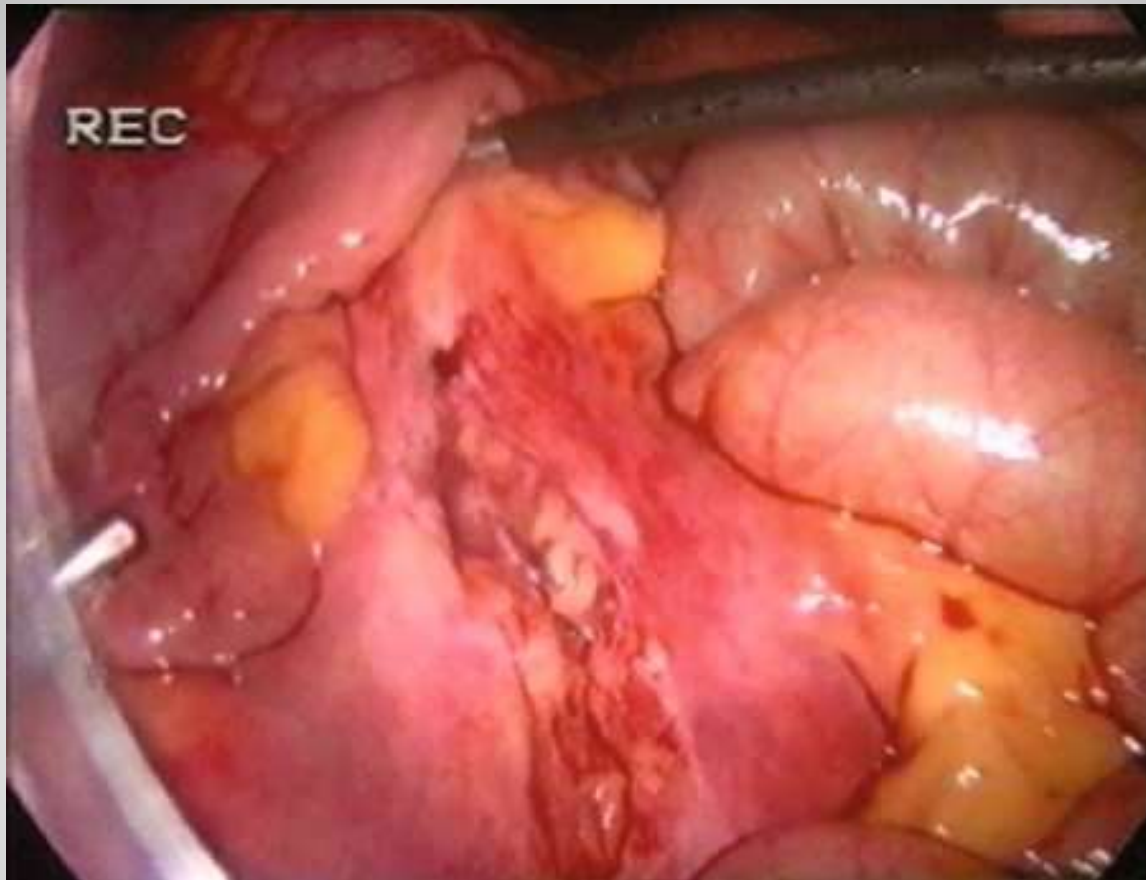


30% reduction in negative laparotomy using zero-degree camera, local anesthesia without additional trocar.

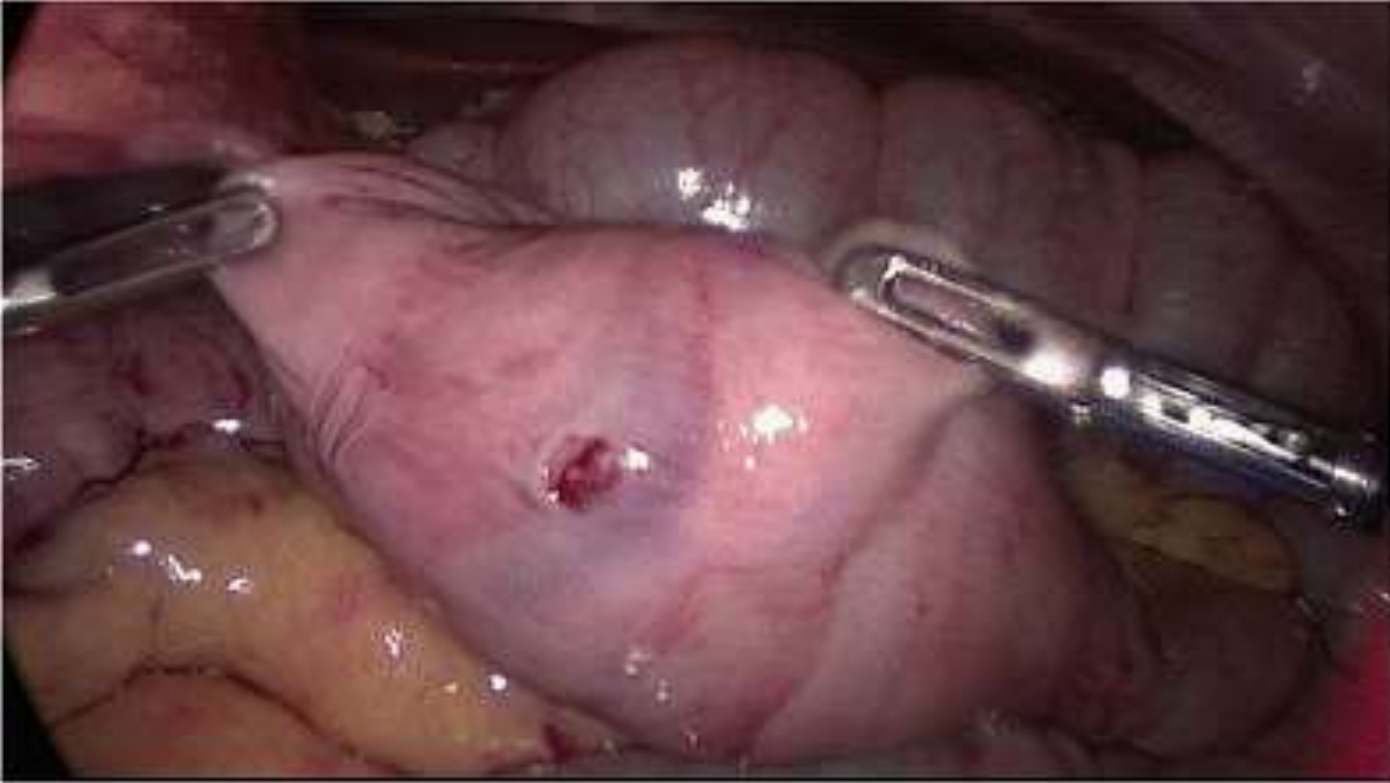
Under general anesthesia it gives a negative laparotomy reduction of up to 50%.

Reduces Negative Laparotomy by up to 98% with 30 ° lens, general anesthesia and 2 trocars.





Laparoscopy in Abdominal Trauma



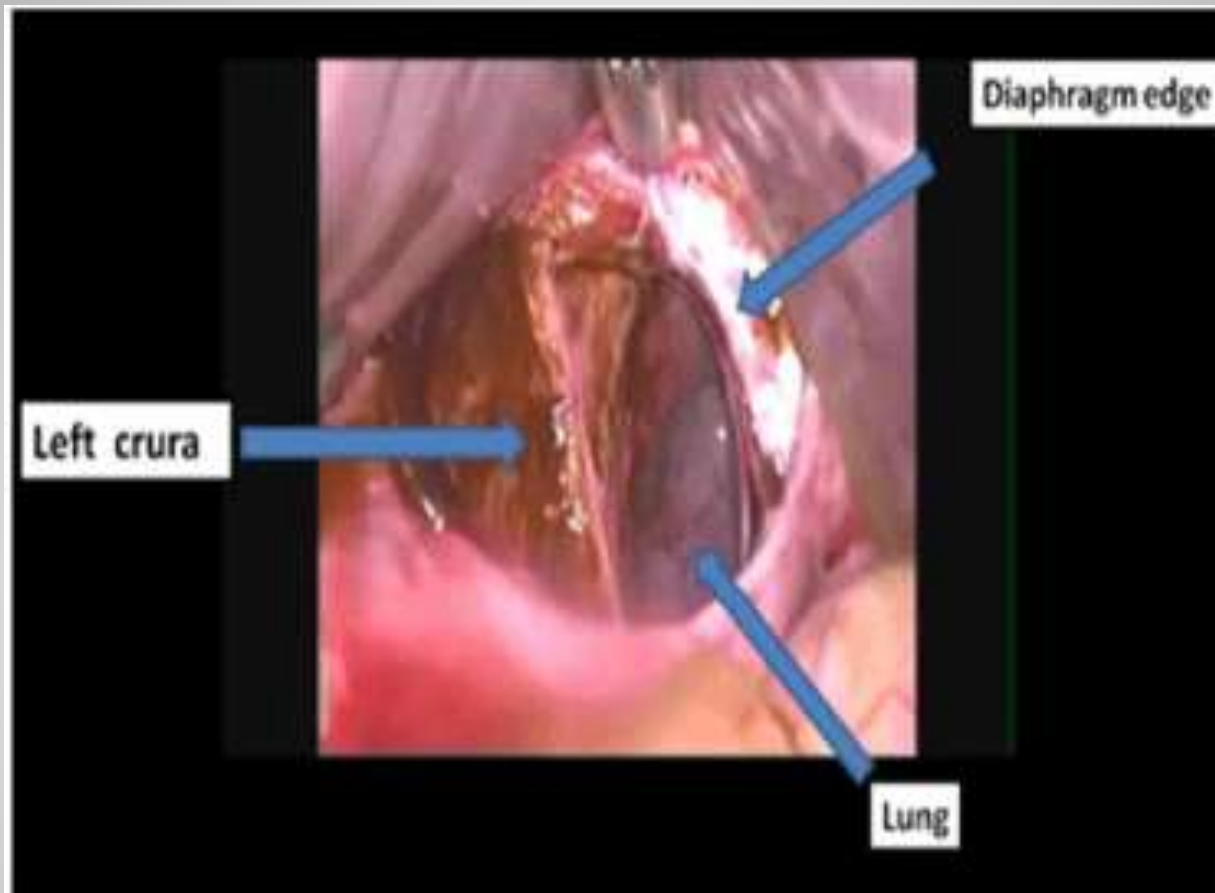
Laparoscopy in Abdominal Trauma



Laparoscopic repair of posttraumatic diaphragmatic rupture.

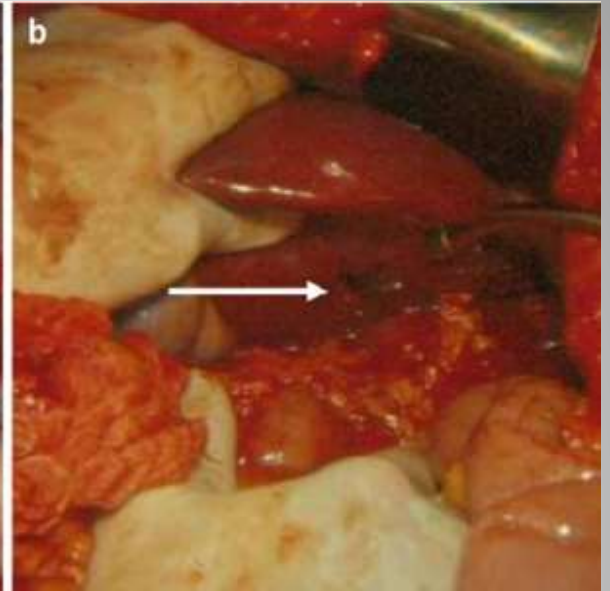
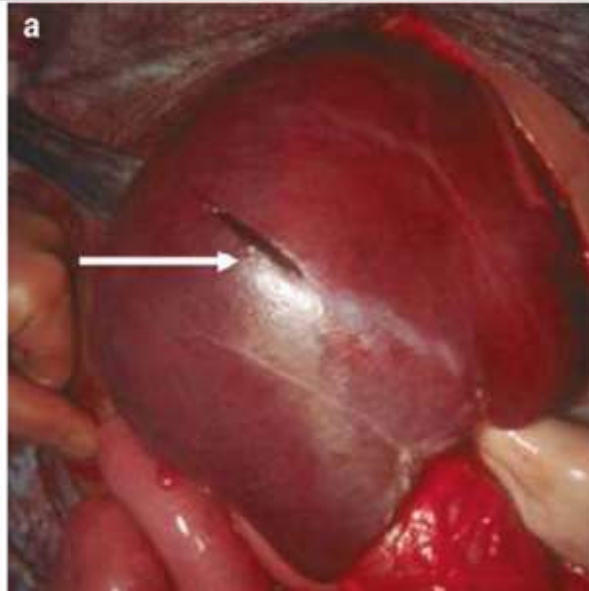


**Laparoscopic view of diaphragmatic
rupture after open heart surgery**

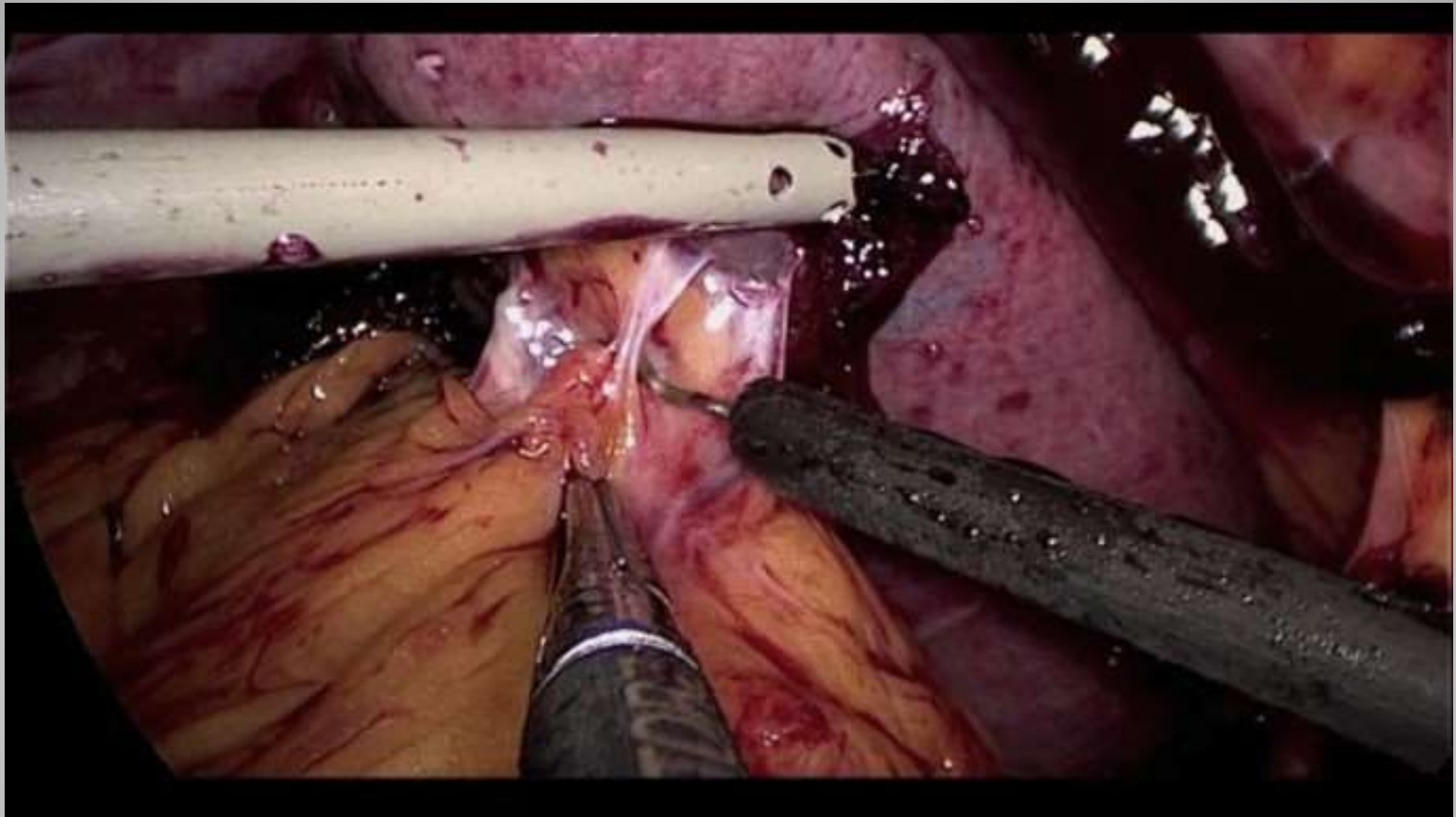


Laparoscopic Repair of Acute Traumatic Diaphragmatic Hernia

Figures 4a and 4b. Penetrating trauma isolated to the liver, such as these translobar a) stab wound and b) gunshot wounds, is often found to have stopped bleeding at the time of laparotomy; for this reason, in selected patients, nonoperative management is been suggested.



Laparoscopic Repair of Acute Traumatic Diaphragmatic Hernia

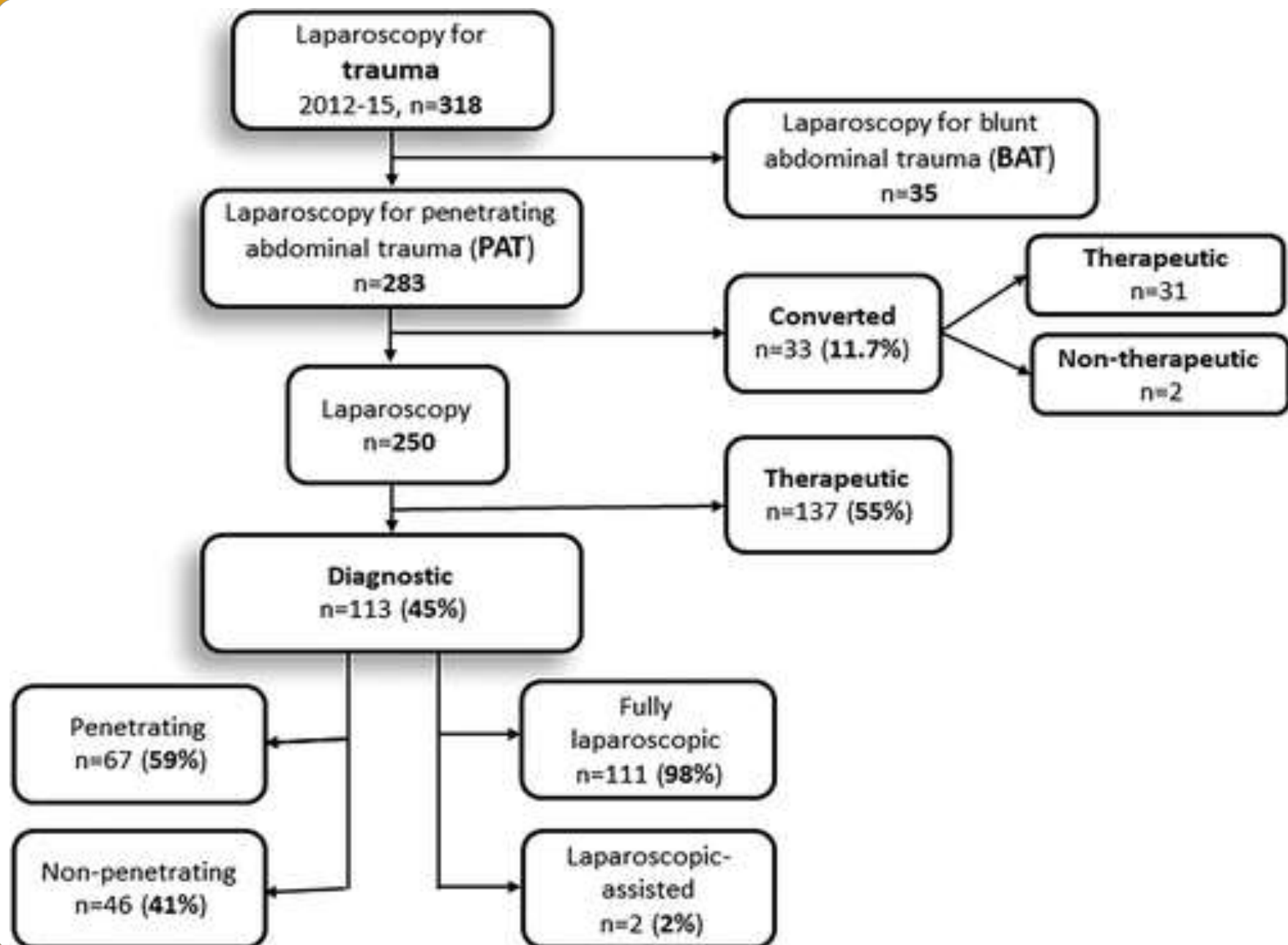


Laparoscopic spleen Trauma

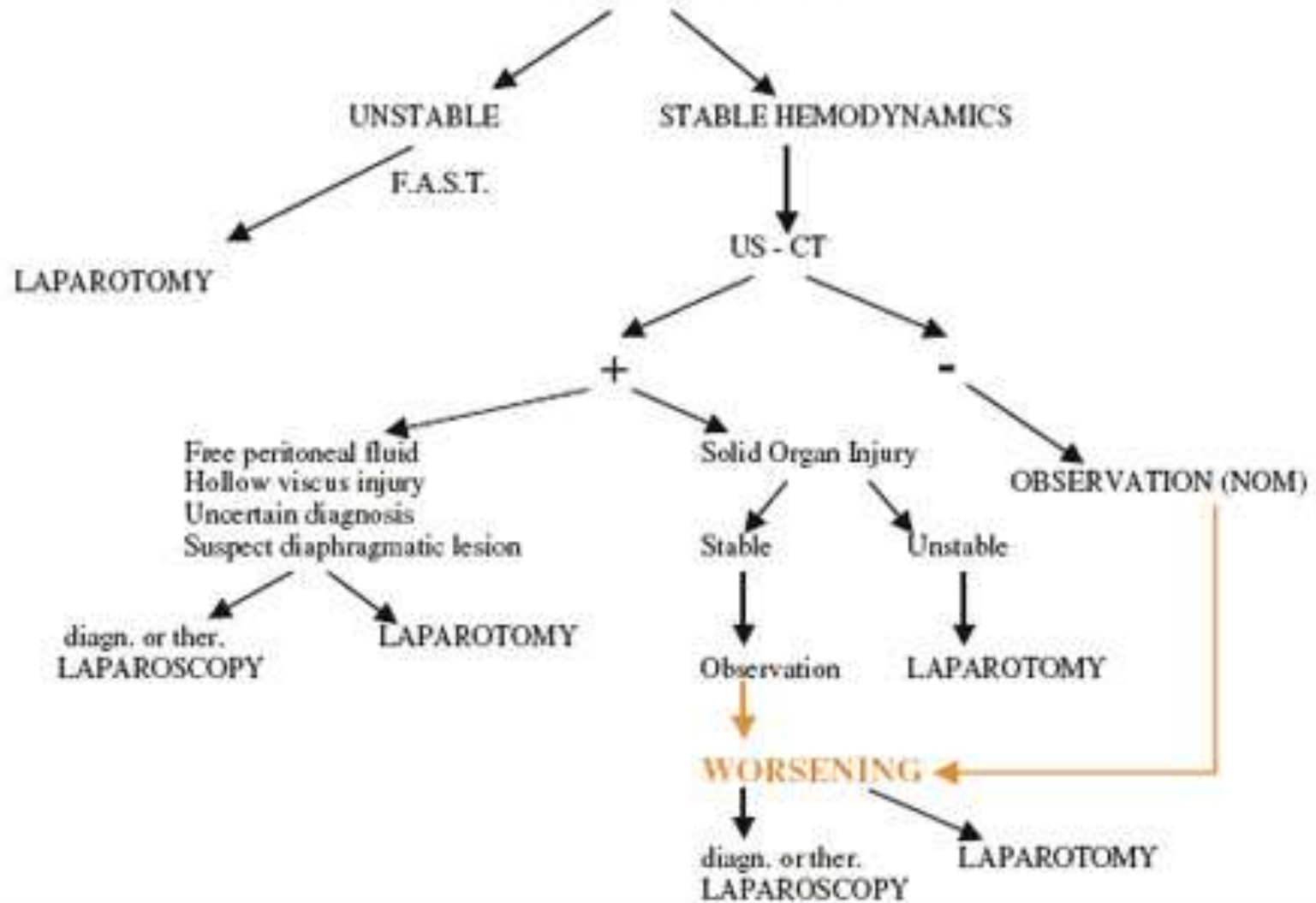
Algorithm 1



Algorithm for the management of penetrating abdominal trauma [1].



BLUNT TRAUMA





با تشکر از توجه شما