



# Guidelines for Diagnostic Laparoscopy

## Preamble

These diagnostic laparoscopy guidelines are a series of systematically developed statements to assist surgeons' (and patients') decisions about the appropriate use of diagnostic laparoscopy (DL) in specific clinical circumstances. The statements included in this guideline are the product of a systematic review of published work on the topic, and the recommendations are explicitly linked to the supporting evidence. The strengths and weaknesses of the available evidence are described and expert opinion sought where the evidence is lacking. This is an update of previous guidelines on this topic (SAGES publication #0012; last revision 2002) as new information has accumulated.

## Disclaimer

Clinical practice guidelines are intended to indicate the best available approach to medical conditions as established by a systematic review of available data and expert opinion. The approach suggested may not necessarily be the only acceptable approach given the complexity of the healthcare environment. These guidelines are intended to be flexible, as the surgeon must always choose the approach best suited to the patient and to the variables at the moment of decision. These guidelines are applicable to all physicians who are appropriately credentialed regardless of specialty and address the clinical situation in question.

These guidelines are developed under the auspices of SAGES, the guidelines committee and approved by the Board of Governors. The recommendations of each guideline undergo multidisciplinary review and are considered valid at the time of production based on the data available. New developments in medical research and practice pertinent to each guideline are reviewed, and guidelines will be periodically updated.

## Clinical Application

Diagnostic laparoscopy is minimally invasive surgery for the diagnosis of intra-abdominal diseases. The procedure enables the direct inspection of large surface areas of intra-abdominal organs and facilitates obtaining biopsy specimens, cultures, and aspiration. Laparoscopic ultrasound can be used to evaluate deep organ parts that are not amenable to inspection. Diagnostic laparoscopy not only facilitates the diagnosis of intra-abdominal disease but also makes therapeutic intervention possible.

## Literature Review Methods

A large body of literature about DL exists. The many clinical situations where DL has been applied, adds complexity to the analysis of the literature. Our systematic literature search of MEDLINE for the period 1995-2005, limited to English language articles, identified 663 relevant reports. The search strategy is shown in **Figure 1** at the end of this document. Using the same



strategy, we searched the Cochrane database of evidence-based reviews and the Database of Abstracts of Reviews of Effects (DARE), which identified an additional 54 articles. Thus, a total of 717 abstracts were reviewed by three committee members (DS, WR, LC) and divided into the following categories:

1. Randomized studies, metaanalyses, and systematic reviews
2. Prospective studies
3. Retrospective studies
4. Case reports
5. Review articles

Randomized controlled trials, metaanalyses, and systematic reviews were selected for further review along with prospective and retrospective studies that included at least 50 patients; studies with smaller samples were reviewed when other available evidence was lacking. The most recent reviews were also included. All case reports, old reviews, and smaller studies were excluded. According to these exclusion criteria, 169 articles were reviewed by the three committee members (DS, WR, LC).

To maximize the efficiency of the review, the articles were divided in the following subject categories:

1. Staging laparoscopy for cancer
  1. Esophageal cancer
  2. Gastric cancer
  3. Pancreatic and periampullary cancers
  4. Liver cancer
  5. Biliary tract cancer
  6. Colorectal cancer
  7. Lymphoma
2. Diagnostic laparoscopy for acute conditions
  1. Acute abdomen
  2. Trauma
  3. ICU
3. Diagnostic laparoscopy for chronic conditions
  1. Chronic pelvic pain and endometriosis
  2. Liver disease (including cirrhosis)
  3. Infertility
  4. Cryptorchidism
  5. Other
4. Other (general reviews, complications, etc.)

The reviewers graded the level of evidence of each article and manually searched the bibliographies for additional articles that may have been missed by our search. Any additional relevant articles (n=33) were included in the review and grading. A total of 140 graded articles relevant to this guideline were included in this review. Based on the reviewer grading of all articles, we devised the recommendations included in these guidelines.



## Levels of Evidence

Level I - Evidence from properly conducted randomized, controlled trials

Level II - Evidence from controlled trials without randomization Cohort or case-control studies  
Multiple time series dramatic uncontrolled experiments

Level III - Descriptive case series, opinions of expert panels

## General Recommendations

Diagnostic laparoscopy is a safe and well tolerated procedure that can be performed in an inpatient or outpatient setting under general or occasionally local anesthesia with IV sedation in carefully selected patients. Diagnostic laparoscopy should be performed by physicians trained in laparoscopic techniques who can recognize and treat common complications and can perform additional therapeutic procedures when indicated. During the procedure, the patient should be continuously monitored, and resuscitation capability must be immediately available.

Laparoscopy must be performed using sterile technique along with meticulous disinfection of the laparoscopic equipment. Overnight observation may be appropriate in some outpatients. There are unique circumstances when office-based DL may be considered. Office-based DL should only be undertaken when complications and the need for therapeutic procedures through the same access are highly unlikely.

### 1) Diagnostic Laparoscopy in the ICU

#### Rationale for the Procedure

A number of reports have described the use of DL in ICU patients. The main argument for the use of DL in ICU patients has been for the diagnosis of suspected intra-abdominal pathology in critically ill patients without the need for transport to the operating room with its potential complications. Furthermore, such an approach allows for the uninterrupted treatment of the ICU patient and may minimize the cost of the intervention.

#### Technique

Many studies have documented the feasibility of the procedure (levels II, III) <sup>[1-10]</sup>. The most common reason that the procedure fails is the presence of severe adhesions. Although in the initial reports on DL for ICU patients the procedure was performed in the operating room, most recent studies have applied the procedure exclusively at the bedside. Local anesthesia, sedation, and occasionally paralytics have been used for the procedure at the bedside. Many patients who are breathing spontaneously require intubation before the procedure; however, the procedure has also been applied successfully in nonintubated patients. In most instances, a portable laparoscopic cart, which contains a monitor, video camera, light source, and gas supply, is used. A cut-down technique and the Veress needle technique have been used for initial access without reported untoward events. The periumbilical region is the most used site for initial access; however, concerns about intra-abdominal adhesions may dictate the use of another “virgin” site. Pneumoperitoneum has been kept at lower levels (8-12 mm Hg) by many



authors due to concerns of hemodynamic compromise in already compromised patients. Nevertheless, level III evidence exists that 15 mm Hg can be used safely without significant hemodynamic or respiratory compromise with the exception of a well tolerated increase in peak inspiratory pressure. No studies have compared different insufflation pressures in ICU patients. Although most studies have used CO<sub>2</sub> for insufflation, the use of N<sub>2</sub>O has also been described. An angled scope is used at the periumbilical trocar site for inspection of the intra-abdominal organs, including the surface of the liver, gallbladder, stomach, intestine, pelvic organs, and visible retroperitoneal surfaces along with examination of free intraperitoneal fluid. Additional (5-mm) trocars are used at the discretion of the surgeon as needed for exposure and for potential therapeutic intervention. The use of laparoscopic ultrasound has not been described in ICU patients. The duration of the procedure is short, ranging between 10 and 70 minutes, with an average duration of about 30 minutes.

## Indications

The main indication for DL in the ICU has been unexplained sepsis, systemic inflammatory response syndrome, and multisystem organ failure. In addition, the procedure has been used for abdominal pain or tenderness associated with other signs of sepsis without an obvious indication for laparotomy (i.e., pneumoperitoneum, massive gastrointestinal bleeding, small bowel obstruction), fever and/or leukocytosis in an obtunded or sedated patient not explained by another identifiable problem (such as pneumonia, line sepsis, or urinary sepsis), metabolic acidosis not explained by another process (such as cardiogenic shock), and increased abdominal distention that is not a consequence of bowel obstruction.

## Contraindications (Absolute or Relative)

- Patients unable to tolerate pneumoperitoneum or who are so sick that there is no realistic chance of survival even if a “treatable” intra-abdominal process were found
- Patients with an obvious indication for surgical intervention such as a bowel obstruction or perforated viscus
- Patients with an uncorrectable coagulopathy or uncorrectable hypercapnia >50 torr
- Patients with a tense and distended abdomen (i.e., clinically suspected abdominal compartment syndrome)
- Patients with abdominal wall infection (e.g., cellulitis, soft tissue infection, open wounds)
- Patients with extensive previous abdominal surgery with multiple incisional scars or after a laparotomy within the last 30 days

## Risks

- Delay in the diagnosis and treatment of patients if the procedure is false negative
- Missed pathology and its associated complications
- Procedure- and anesthesia-related complications

## Benefits



- Expeditious diagnosis of suspected intra-abdominal pathology
- Minimization of treatment interruption by not moving the patient outside the ICU
- Avoid the morbidity of open exploration
- Avoid potential risks associated with transportation to the operating room or radiology for diagnostic tests
- Ability to provide therapeutic intervention

## Diagnostic Accuracy of the Procedure

The diagnostic accuracy of the procedure is high, ranging between 90 and 100% in the published series (level II, III) <sup>[1-10]</sup>. The main limitation of the procedure is for the evaluation of retroperitoneal structures with the few false negative reported findings attributed to retroperitoneal processes like pancreatitis <sup>[4,9]</sup>. Nevertheless, the procedure appears to have excellent accuracy when evaluating for two of the most prevalent diseases in this population, acalculous cholecystitis and ischemic bowel (level II, III) <sup>[4,5,7,10]</sup>. The procedure has been reported to prevent unnecessary laparotomies in 36-95% of patients (level III) <sup>[1,2,5,6]</sup>. Its sensitivity has also been demonstrated in patients with suspected abdominal complications after cardiac surgery <sup>[4,9]</sup>.

Diagnostic laparoscopy has been compared with diagnostic peritoneal lavage and found to have superior diagnostic accuracy in critically ill patients (level II) <sup>[5]</sup>. It has also been found to be superior to computed tomography (CT) or ultrasound of the abdomen (level III) <sup>[3,6,7,10]</sup>.

## Procedure-related Complications and Patient Outcomes

The procedure can be performed safely, is well tolerated in ICU patients (level II) <sup>[5]</sup>, and only a few minor complications have been described (bradycardia and increased peak airway pressure that resolved after release of pneumoperitoneum and perforation of a gangrenous gallbladder during manipulation). Overall morbidity has been reported between 0 and 8%, and no mortality directly associated with the procedure has been described <sup>[1-10]</sup>. Nevertheless, the ICU patient population has very high mortality rates (33-79%) regardless of the findings of DL.

## Cost-effectiveness

While it has been implied that DL in the ICU rather than the operating room can yield substantial cost savings, no direct evidence exists.

## Limitations of the Available Literature

A few single-center studies of limited quality, which include small patient cohorts, address the role of DL in the ICU population making generalizations difficult and allowing institutional and personal biases to be introduced into the results. There is also a lack of uniformity and detail in the reported selection criteria and noninvasive imaging prior to the procedure. These limitations of the available literature and the high mortality rates of this patient population make it difficult to draw firm conclusions about the impact of the procedure on patient outcomes and its cost-



effectiveness. Furthermore, the impact of the surgeon's laparoscopic expertise on the diagnostic accuracy of the procedure is unknown.

## Recommendations

Diagnostic laparoscopy is technically feasible and can be applied safely in appropriated selected ICU patients (grade B). The procedure should be used in critically ill patients when an intra-abdominal catastrophe is suspected but cannot be ruled out by noninvasive means and would otherwise require an exploratory laparotomy (grade C). It should be given strong consideration in ICU patients with suspected acalculous cholecystitis or ischemic bowel, as its accuracy likely exceeds that of noninvasive studies (grade C). On the other hand, it should be kept in mind that the procedure is unlikely to identify retroperitoneal processes. The decision to undertake DL and at which location (bedside or operating room) should be individualized and should be based on the available resources and laparoscopic expertise of the surgeon.

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## 2) Diagnostic Laparoscopy for Trauma



## Rationale for the Procedure

Exploratory laparotomies in trauma patients with suspected intra-abdominal injuries are associated with a high negative laparotomy rate and significant procedure-related morbidity. Diagnostic laparoscopy has been proposed for trauma patients to prevent unnecessary exploratory laparotomies with their associated higher morbidity and cost.

## Technique

Many studies have documented the feasibility and safety of the procedure in trauma patients (level I-III) <sup>[1-25]</sup>. The procedure is usually performed under general anesthesia; however, local anesthesia with IV sedation has also been used successfully. The latter, in conjunction with a dedicated mobile cart, facilitates the procedure in the emergency department. A recent study demonstrated the safety and advantages of awake laparoscopy under local anesthesia in the emergency department over standard DL in the operating room (level III) <sup>[21]</sup>. Many authors have used 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.

In the case of penetrating wounds, air leaks can be controlled with sutures. 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
- More specific indications include:
- 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 (defined by most studies as systolic pressure
- 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

## **Risks**

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

## **Benefits**

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

## **Diagnostic Accuracy of the Procedure**

The sensitivity, specificity, and diagnostic accuracy of the procedure when used to predict the need for laparotomy are high (75-100%) (level I-III) <sup>[1-25]</sup>; however, they depend on several factors (see Limitations of the Available Literature). When DL has been used as a screening tool (i.e., early conversion to open exploration with the first encounter of a positive finding like the identification of peritoneal penetration in penetrating trauma or active bleeding/peritoneal fluid in blunt trauma patients), the number of missed injuries is