Current Guidelines For Diagnosis In Blunt Abdominal Trauma

Blunt abdominal trauma (BAT) is a leading killer of adult and pediatric trauma victims. In this issue of *EM Practice Guidelines Update*, we review 2 guidelines that address the diagnosis of injury due to BAT. These guidelines evaluate the following diagnostic modalities: computed tomography (CT), diagnostic peritoneal lavage (DPL), and bedside ultrasound, namely, the Focused Assessment with Sonography in Trauma (FAST). Practice patterns in the diagnosis of BAT have evolved over the last decade, and these changes are evident in the 2 guidelines abstracted. Trauma care makes significant demands on the emergency clinician: physical examination is notoriously unreliable in identifying intra-abdominal injury, and use of CT, DPL, and ultrasound each requires a different skill set. In addition, coordination of care with trauma surgeons and radiologists is frequently necessary. These guidelines review comparative evidence of the accuracy of CT, DPL, and FAST, and make recommendations for incorporating these modalities into diagnostic algorithms.

Practice Guideline Impact

- FAST should be the initial diagnostic modality to evaluate for hemoperitoneum.
- CT is accurate in determining the presence of injury and delineating the need for operation in BAT but is best reserved for hemodynamically stable patients.
- DPL is accurate in diagnosing intraperitoneal injury but has a limited role in current practice.
- Bowel, diaphragm, and pancreas injuries are difficult to exclude with any of the 3 diagnostic modalities.
- CT, FAST, and DPL play complementary roles in BAT diagnostic algorithms.
These guidelines were developed under the auspices of the Eastern Association for the Surgery of Trauma (EAST) by the EAST Practice Management Guidelines Work Group, consisting of 8 trauma surgeons. The funding body is not explicitly described, but may be presumed to be EAST. The expressed purpose of the study was to develop an evidence-based, systematic, diagnostic approach to BAT utilizing DPL, CT, and FAST.

References were identified by a MEDLINE® search using the key words “abdominal injuries” and the subheading “diagnosis.” The search was limited to English publications of clinical research published between January 1978 and February 1998. Subcommittee members formally reviewed these references and completed a review data sheet, summarizing conclusions and identifying deficiencies. Reviewers classified each reference as follows:

- **Class I** – prospective, randomized, double-blinded study
- **Class II** – prospective, randomized, non-blinded trial
- **Class III** – retrospective series, meta-analysis

After exclusion, 101 references remained from the initial list of 742 citations: Class I (20); Class II (32); Class III (49).

Recommendations were graded as Level I, II, or III, but no explicit explanation was provided for the grading process. Disclosures were not made available in the document. The primary audience for the document was trauma surgeons with 1 mention of emergency physicians.

**EAST Recommendations**

**A. Level I**

1. Exploratory laparotomy is indicated for patients with a positive DPL.
2. CT is recommended for the evaluation of hemodynamically stable patients with equivocal findings on physical examination, associated neurologic injury, or multiple extra-abdominal injuries. Under these circumstances, patients with a negative CT should be admitted for observation.
3. CT is the diagnostic modality of choice for nonoperative management of solid visceral injuries.
4. In hemodynamically stable patients, DPL and CT are complementary diagnostic modalities.

**B. Level II**

1. FAST may be considered as the initial diagnostic modality to exclude hemoperitoneum. In the presence of a negative or indeterminate FAST result, DPL and CT have complementary roles.
2. When DPL is used, clinical decisions should be based on the presence of gross blood on initial aspiration (ie, 10 mL) or microscopic analysis of lavage effluent.
3. In hemodynamically stable patients with a positive DPL, follow-up CT scan should be considered, especially in the presence of pelvic fracture or suspected injuries to the genitourinary tract, diaphragm or pancreas.
4. Exploratory laparotomy is indicated in hemodynamically unstable patients with a positive FAST. In hemodynamically stable patients with a positive FAST, follow-up CT permits nonoperative management of select injuries.
5. Surveillance studies (ie, DPL, CT, repeat FAST) are required in hemodynamically stable patients with indeterminate FAST results.

C. Level III
1. Objective diagnostic testing (ie, FAST, DPL, CT) is indicated for patients with abnormal mentation, equivocal findings on physical examination, multiple injuries, concomitant chest injury, or hematuria.
2. Patients with seatbelt sign (SBS) should be admitted for observation and serial physical examination. Detection of intraperitoneal fluid by FAST or CT in a patient with SBS mandates either DPL to determine the nature of the fluid or exploratory laparotomy.
3. CT is indicated for the evaluation of suspected renal injuries.
4. A negative FAST should prompt follow-up CT for patients at high risk for intra-abdominal injuries (eg, multiple orthopedic injuries, severe chest wall trauma, neurologic impairment).
5. Splanchnic angiography may be considered in patients who require angiography for the evaluation of other injuries (eg, thoracic aortic injury, pelvic fracture).

Clinical Policy: Critical Issues In The Evaluation Of Adult Patients Presenting To The Emergency Department With Acute Blunt Abdominal Trauma²


This document was developed by the American College of Emergency Physicians (ACEP) Clinical Policies Committee and the Clinical Policies Subcommittee on Acute Blunt Abdominal Trauma. A MEDLINE® search was conducted for English-language articles published between 1966 and June 2002 using “abdominal injuries” and “abdominal trauma” in combination with other relevant search terms. All articles were graded for strength of evidence by at least 2 subcommittee members.

The process ACEP uses for development of its Clinical Policies is based on review of the existing literature, and when not available, on expert consensus opinion. For this policy, expert review comments were obtained from internal ACEP sections and a committee, individual emergency physicians, and individual members of the American College of Surgeons Committee on Trauma and the American Academy of Family Physicians. A revision of this clinical policy is scheduled for completion in early 2011.

Based on the design of the study, all articles were classified as diagnostic, therapeutic, or prognostic clinical reports. Articles were graded based on 6 dimensions that measure the rigor and validity of the research. A predetermined formula based on the design and grade of the study was used to arrive at a final grade (I, II, III). Level A, B, and C recommendations for patient management were made based on the following criteria:

- **Level A recommendations**: Generally accepted principles for patient management that reflect a high degree of clinical certainty.
- **Level B recommendations**: Recommendations for patient management that may identify a particular strategy or range of management strategies that reflect moderate clinical certainty.
- **Level C recommendations**: Other strategies for patient management based on preliminary, inconclusive, or conflicting evidence, or in the absence of any published literature, based on panel consensus.

The aim of the document was to analyze evidence and make recommendations about CT, DPL, and ultrasound for the diagnosis of intra-abdominal injury in adult blunt trauma patients. Pregnant women, children, and victims of penetrating abdominal injuries were excluded from this policy. The target audience was physicians working in hospital-based EDs. Four critical questions and their subsequent answers were presented to impart relevant data and conclusions.

**Critical Question I. What is the diagnostic performance of CT in diagnosing significant intra-abdominal injuries requiring intervention in blunt abdominal trauma?**

- **Level A recommendations**: None specified.
- **Level B recommendations**: When either liver or spleen injury is suspected, CT can reliably exclude injuries that require emergent operative intervention. CT alone cannot be used to exclude either bowel, diaphragm, or pancreas injury. Abdominal CT accurately identifies hemoperitoneum among patients with blunt abdominal trauma.
- **Level C recommendations**: None specified.
Critical Question II. Does oral contrast improve the diagnostic performance of CT in blunt abdominal trauma?

- **Level A recommendations.** None specified.
- **Level B recommendations.** Oral contrast is not essential to the evaluation of blunt abdominal trauma.
- **Level C recommendations.** None specified.

Critical Question III. What is the diagnostic performance of FAST in diagnosing hemoperitoneum in blunt abdominal trauma?

- **Level A recommendations.** None specified.
- **Level B recommendations.** FAST is useful as an initial screening examination to detect hemoperitoneum in blunt abdominal trauma patients.
- **Level C recommendations.** None specified.

Critical Question IV. What is the diagnostic performance of diagnostic peritoneal lavage in diagnosing significant intra-abdominal injuries requiring intervention in blunt abdominal trauma?

- **Level A recommendations.** None specified.
- **Level B recommendations.** Diagnostic peritoneal lavage can be used to exclude hemoperitoneum in blunt abdominal trauma patients. Diagnostic peritoneal lavage does not define the extent of injury, has a 1% to 2% complication rate, and may lead to non-therapeutic laparotomies.
- **Level C recommendations.** On the basis of consensus and current practice patterns, the initial choices for the evaluation of blunt abdominal trauma are CT and FAST, depending on the patient’s hemodynamic stability.

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Blunt abdominal trauma affects patients of all ages and is a leading cause of morbidity and mortality in young people. Physical examination can have limited utility in BAT that is due to neurologic injury, distracting injury, intoxication, and altered sensorium. In BAT, CT, DPL, and bedside ultrasound have complementary roles, and the emergency clinician must understand the utility and accuracy of these modalities. The assessment of hemodynamic stability is the fulcrum in diagnostic algorithms for BAT; it guides decisions about which of these adjuncts the emergency clinician should employ.

The EAST guidelines tell of a time when the introduction of CT for BAT met resistance. Concerns about transport away from the trauma resuscitation area and the need for a cooperative and hemodynamically stable patient are still relevant today; nevertheless, CT has been widely accepted as the principal tool in the diagnostic armamentarium of traumatologists. Other disadvantages of CT include exposure to radiation and intravenous contrast as well as cost. Attempts to study the utility and accuracy of CT are complicated by the fact that CT technology and the indications for laparotomy are continually evolving. Most of the literature assessing CT in BAT is retrospective, and the acceptance of CT as a criterion standard makes it unlikely there will be many future prospective studies.

Computed Tomography. CT has excellent sensitivity and specificity for intra-abdominal injury, particularly for the identification of liver and spleen injury and hemoperitoneum. One study found a negative predictive value of 99.63% and concluded that safe discharge following a negative CT scan is permitted. CT is less reliable in diagnosing bowel, mesenteric, pancreas, and diaphragmatic injury. The sensitivity of CT for diagnosing bowel injury ranges from 64% to 94%.

Oral Contrast. The ACEP Clinical Policy addresses the topic of oral contrast use for CT in BAT. Theoretical advantages to the use of oral contrast include the improved ability to identify bowel injury with extravasation, mesentery and pancreas injury, and hematomas. Disadvantages include vomiting, aspiration, delayed diagnosis, and the potential complications of nasogastric tube insertion (if done for contrast administration). Nevertheless, the sensitivity of CT does not differ significantly with or without oral contrast use, and contrast extravasation in the setting of bowel injury occurs at a very low rate (2.9%).

Diagnostic Peritoneal Lavage. Since its introduction by Root in 1965, DPL has been found to be very accurate for the identification of intra-abdominal injury. The open and closed techniques have a similar sensitivity, specificity, and complication rate, but the closed technique can be performed more quickly.

A positive DPL is defined as the aspiration of 5-10 mL of frank blood; an RBC count of 100,000/mL in the effluent after a 1 L lavage of isotonic fluid; or a WBC greater than 500/mL in the effluent. The value of WBC analysis has been brought into question, and gram stain and measures of amylase and alkaline phosphatase are insensitive for injury. The sensitivity of DPL approximates 98%, and as little as 20 mL of blood may be detected. The technique of DPL is less reliable for detecting bowel and diaphragmatic injuries, and is essentially incapable of identifying retroperitoneal injury. The complication rate for DPL is 1% to 2%, but the potential for unnecessary laparotomy is considerable if the decision to operate is based solely on positive findings. CT is recommended to evaluate for operative need in a hemodynamically stable patient with a positive DPL, but where CT is available, indications for DPL in a stable patient are few.

The dichotomous recommendations of EAST and ACEP regarding DPL represent a change in practice over time more than a shift in evidence. DPL has fallen out of favor due to its invasive nature, inability to delineate injury, resultant nontherapeutic laparotomies, and the rise to prominence of FAST and CT.
Ultrasound. Trauma ultrasound is noninvasive, portable, repeatable, cost-effective, and can be performed quickly and concurrently with resuscitation. The sensitivity for FAST in diagnosing intraperitoneal fluid ranges from 68% to 91%, with near-perfect specificity. These results are found consistently among practitioners of trauma surgery, emergency medicine, radiology, and ultrasound technicians, but variability in accuracy within specialties exists. In particular, emergency physician experience with ultrasound is not uniform, which is a relevant consideration because the modality is operator-dependent. FAST is not reliable for diagnosing injury to the bowel, pancreas, diaphragm, retroperitoneal structures, and solid organs without hemoperitoneum. Further applications for ultrasound in trauma include the evaluation for pneumothorax, hemothorax, orthopedic fractures, ocular trauma, pregnancy, and central venous pressure (CVP) estimation.

Comparing Strategies. The guidelines report only one prospective study that compared CT, DPL, and ultrasound in BAT. In this small study, 55 patients received all 3 diagnostic adjuncts, and 39 went on to have laparotomy. CT, DPL, and ultrasound proved to have comparably high sensitivity and specificity. Numerous retrospective comparative studies that evaluate the diagnostic accuracy of CT, DPL, and FAST are presented; however, these guidelines report no prospective randomized studies that investigated the incorporation of these modalities into BAT diagnostic algorithms or their effect on clinical outcomes. Melniker et al in 2006 published findings on the randomization of 262 patients to receive FAST or routine trauma care without ultrasound. Time-to-operation, hospital length-of-stay, use of CT and DPL, and charges were significantly reduced in the FAST group.

Conclusion. Diagnostic strategies for trauma care should utilize CT, FAST, and DPL as complementary modalities. The recommendations made by EAST and ACEP for the use of these diagnostic adjuncts in BAT hinge on hemodynamic stability. FAST is recommended as a useful initial tool to evaluate for hemoperitoneum. For hemodynamically stable patients, a positive FAST necessitates CT to further delineate injury. For unstable patients, laparotomy is recommended in patients with a positive FAST. A negative FAST may not be sensitive enough to exclude pathology, and the decision to proceed to CT must be based upon pretest probability for intra-abdominal injury. For the most part, FAST and CT obviate the need for DPL. Two indications for DPL still exist in the unstable patient: an equivocal FAST or the need to differentiate ascites or urine from blood.

References
3. Livingston DH, Lavery RF, Passannante MR, et al. Admission or observation is not necessary after a negative abdominal computed tomographic scan in patients with suspected blunt abdominal trauma: Results of a prospective, multi-institutional trial. J Trauma. 1998;44:272-282. (Prospective cohort; 229 patients)
To write a letter to the editor, email Reuben Strayer, MD, Editor-In-Chief, at: strayermd@ebmedicine.net

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