Significant Hemoperitoneum in Blunt Trauma Victims With Normal Vital Signs and Clinical Examination

MICHAEL BLAIVAS, MD, RDMS,* PAUL SIERZENSKI, MD, RDMS,† AND DANIEL THEODORO, MD

Clinical examination of the abdomen is generally reliable in stable trauma patients with no distracting or head injury. Patients involved in relatively minor trauma with normal examinations can be safely sent home in most instances. We report 6 cases of blunt abdominal trauma that had completely normal clinical examinations and vital signs but were found to have significant hemoperitoneum on trauma ultrasound examination. Four of the patients were examined for educational purposes just before planned discharge from the emergency department. These cases suggest that a screening ultrasound examination may have a role in the evaluation of most blunt trauma patients. (Am J Emerg Med 2002;20:218-221. Copyright 2002, Elsevier Science (USA). All rights reserved.)

Bedside ultrasonography in the evaluation of blunt trauma patients is one of the most widely accepted ultrasound applications in emergency medicine. It is also one of the earliest applications of ultrasound used widely by physicians who are nonradiologists. A number of studies have documented the use of the focused abdominal sonography for trauma (FAST) examination.1-8 The FAST examination is most useful in blunt trauma patients with unstable vital signs. The discovery of large amounts of fluid in the abdomen can lead to immediate operative intervention and save lives as well as resources.7,8 Conversely, a patient with no fluid in the abdomen would not benefit from emergency laparotomy, and a search should be made of other causes of abnormal vital signs such as pelvic fracture, pericardial effusion, extremity injury, hemotherax, or spinal cord injury.

Patients presenting in stable condition with a normal sensorium, no distracting injuries, and a normal physical examination have been thought safe to be sent home. This does not apply to patients who have an altered mental state or severe distracting injuries.9,10 Altered pain perception can lead to significant missed injuries, which has been well documented in the surgical literature.11,12 Further, pediatric patients may be unreliable for abdominal examination, and a conservative approach with either admission and observation or computed tomography (CT) scan is indicated.13,14

Most emergency physicians would not expect patients with a normal examination and vital signs to have abdominal injury. However, this may not always be the case. We report 6 cases of abdominal trauma with large amounts of hemoperitoneum found incidentally on bedside emergency ultrasound examination. In the following cases, a small amount of intraperitoneal fluid is defined as a fluid stripe less than 1 cm, a moderate amount of intraperitoneal fluid is defined as 1 to 3 cm, and large peritoneal fluid amount is defined as over 3 cm of fluid stripe in Morison’s pouch.15

CASE 1

J.H. is a 52-year-old woman with a history of tubal ligation and tonsillectomy. The patient was the restrained driver of a minivan involved a front-end collision. There was no loss of consciousness (LOC), and the patient had clear recall of the accident. Airbags had deployed, and she was ambulatory at the scene. On arrival in the emergency department (ED), the patient had no complaints. Vital signs included a blood pressure of 153/89 mm Hg, heart rate of 76 beats per minute (rpm), respiratory rate of 14, temperature of 98.1° F, and oxygen saturation of 98% on room air. Physical examination revealed the head, neck, lung, heart, and extremities to be unremarkable. The abdominal examination showed a mildly obese nondistended abdomen with no pain on palpation, guarding, or rebound. Bowel sounds were normal in all 4 quadrants.

The ED attending as well as the trauma residents and attending who were seeing a patient in an adjacent bay evaluated the patient. She was felt to have no injuries and was discharged home. Before actual discharge, an educational FAST examination was performed by the ED attending explicitly for teaching a trauma resident who had never performed one. Unexpectedly, the patient’s abdomen was noted to have a large quantity of fluid (Fig 1). The patient’s discharge was canceled, and 2 large bore intravenous lines were placed. Emergency CT was performed. The radiologists noted a significant splenic laceration and fluid in the abdomen. The patient was taken to the operating room for an exploratory laparotomy that resulted in a splenectomy. She recovered uneventfully and left the hospital 3 days later.

CASE 2

N.S. is a 22-year-old man without significant past medical history who was a restrained driver in a rollover at moderate speed. The patient stayed in the vehicle and had...
CASE 3

G.H. is a 19-year-old man with no significant past medical history who was a restrained driver struck in the rear of his car on the driver’s side. The car suffered moderate damage. The patient had no LOC and complained of right knee pain. He was quickly extricated from the car and boarded and collared. On arrival in the ED, the patient had a blood pressure of 125/78 mm Hg, heart rate of 84 bpm, respiratory rate of 14, temperature of 96.9° F, and oxygen saturation of 98% on room air. The head, neck, lung, and extremity examinations were unremarkable with the exception of a 2-cm laceration on the right knee. The abdominal examination revealed a soft, nontender abdomen with no pain on palpation of all 4 quadrants. The patient was clinically cleared and taken off the board. While waiting, the patient volunteered to have a training FAST examination performed on him. A moderate amount of fluid was noted in Morison’s pouch, splenorenal recess, and pelvis. An abdominal CT scan was ordered and revealed a large splenic laceration and fluid throughout the abdomen. The patient was taken to the operating room where his spleen was removed. He was found to have almost 2 L of blood in his abdomen. The patient suffered a wound dehiscence before discharge but recovered completely.

CASE 4

J.B. is a 44-year-old woman with a history of asthma who was the passenger on a motorcycle that lost control and tumbled at a moderate rate of speed. The patient was wearing a helmet and leather riding gear. She reported no loss of consciousness and ambulated at the scene. During transport with emergency medical services, she noted right ankle pain and complained of back discomfort from the board. On arrival in the ED, the patient’s blood pressure was 115/65 mm Hg, heart rate was 78 bpm, respiratory rate was 16, temperature was 96.0° F, and oxygen saturation was 99% on room air. The head, neck, and lungs were unremarkable. Extremity examination showed a shallow 1.5-cm laceration of the right lateral maleolus without deformity or bony tenderness. The abdominal examination showed a soft, nontender abdomen with no pain on palpation of all 4 quadrants.

The patient was clinically cleared and taken off the board. No further testing was believed to be needed. The patient agreed to a request by the trauma attending for a FAST examination that revealed a large amount of fluid in the pelvis and Morison’s pouch. An abdominal CT scan was ordered and showed a splenic laceration and large amount of fluid in the abdomen. The patient was taken to the operating room where her spleen was repaired with mesh. She was discharged 7 days later with a postoperative pneumonia treated with oral antibiotics.

CASE 5

K.P. is a 36-year-old woman with no significant past medical history who slipped on ice and fell down approximately 5 stairs onto her left side. The patient had no loss of consciousness and complained of left thigh pain. She arrived to the ED by private automobile. On physical examination, her blood pressure was 120/60 mmHg, heart rate was 77 bpm, respiratory rate was 14, oxygen saturation was 100% on room air, and she was afebrile. Eye and head examination showed an abrasion to the left forehead. The neck, lung, and heart examinations were normal. Abdominal examination showed an abrasion on the left flank, without pain on palpation or crepitus. Extremity examination revealed a left thigh abrasion with no deformity and minor discomfort on palpation.

The patient was clinically cleared and dispositioned for discharge. A bedside ultrasound examination was performed for teaching purposes with the patient’s permission that revealed fluid in the splenorenal recess and pelvis. A urine human chorionic gonadotropin (HCG) was negative. An abdominal CT scan was ordered and showed a large amount of fluid in the abdomen and a splenic laceration. The patient was admitted and treated conservatively at her insistence. She required 1 transfusion during her hospital course and was followed with repeat abdominal CT scan. She was discharged 5 days later without complication.
CASE 6

J.N. is an 18-year-old man who fell onto a metal rail striking his right upper quadrant and his right hand while skateboarding. The patient had no LOC and was able to ambulate. On arrival to the ED, he complained of right wrist pain. Physical examination showed a blood pressure of 130/74 mm Hg, heart rate of 86 bpm, respiratory rate of 16, and oxygen saturation of 99% on room air. Eye and neck examinations were normal. Head examination showed a minor abrasion over the right eyebrow. Heart and lung examinations were negative. Abdominal and chest examinations showed a midaxillary abrasion over ribs 8 and 9. No fractures or crepitus was noted. All 4 quadrants of the abdomen were completely normal with bowel sounds present. Extremity examination showed equal pulses in all 4 extremities and no deformities. There was mild wrist tenderness in the right snuffbox.

The patient was cleared clinically and removed from board and collar. A radiograph of the right wrist revealed no fracture. As part of ongoing training, the patient received a FAST examination, which revealed a fluid stripe in Morison’s pouch. No fluid was noted elsewhere. An abdominal and pelvic CT scan was ordered, which confirmed the presence of a moderate amount of fluid in the abdomen but no organ injury was detected. The patient was admitted for conservative treatment. Shortly after arrival in the trauma ward, the patient’s systolic blood pressure dropped below 90 mm Hg, and he was taken to the operating suite. A mesenteric tear was noted and repaired. No further injury was noted on laparotomy. The patient was discharged without further complications 5 days later.

DISCUSSION

Ultrasound in the evaluation of trauma patients dates back almost 20 years. Over the last 5 years, the FAST examination has become part of the advance trauma life support protocol and has been endorsed by several organizations. The FAST examination has largely replaced the diagnostic peritoneal lavage in trauma centers that use this technology and often results in a more rapid and efficient evaluation of the trauma patient.

It is generally accepted in emergency medicine practice that not all patients sustaining blunt trauma need diagnostic imaging provided they have no complaints of pain, are clinically stable, and no distracting injury nor change in mental status exist. A normally mentating patient with normal vital signs and no head injury, distracting injury, or abdominal pain could be sent home without a diagnostic peritoneal lavage (DPL), abdominal CT scan, or other imaging modalities. However, there are patient subgroups in which significant missed injury is a possibility. These have traditionally included patients who have altered levels of consciousness for whatever reason and spinal cord injury patients who may lack the sensation necessary to detect abdominal pain.

The literature on missed injuries in patients with normal levels of consciousness generally describes delayed splenic rupture, occasionally caused by conservative treatment failure. However, careful review of the articles shows that the patients discussed had abdominal pain on physical examination, and an argument could be made that they required further diagnostic studies such as an abdominal CT scan. Another group of trauma patients in whom abdominal injury can be missed with ease is the pediatric population. Gordon reported on 40 cases of missed injuries in pediatric trauma patients, the majority of which were orthopedic injuries. Missed abdominal injuries included 3 patients with ruptured spleens, 3 with liver rupture, and 1 with ruptured bowel. However, some of the patients in the study were under 5 years of age and typically present a diagnostic challenge.

Cases of spontaneous splenic rupture such as with monocytosis have been reported and, as described in 1 emergency medicine report, can be concomitant with minimal to no abdominal pain. However, we could find no instances in the English literature in which cases of significant hemoperitoneum were found in blunt trauma patients that were clinically normal and ready to be discharged home. In part, this could be because of the lack of easily available diagnostic tools at the bedside such as the ultrasound machine. Previously, these patients would have simply been sent home without the diagnosis being obtained on the initial visit. Some of them may have even done well and required no return visits, whereas others could have succumbed after discharge. With the spread of ultrasound technology throughout emergency medicine, it is likely that such cases will be encountered more frequently.

Other investigators have expressed misgivings regarding the reliability of physical examination. Bennett and Jehle noted, “Even alert patients with isolated abdominal trauma resulting in intraperitoneal hemorrhage may be deceptively asymptomatic.” However, the investigators cited no literature to support this position. Scalea et al raised the concern that young patients may be able to lose up to 60% of total circulating blood volume and remain relatively asymptomatic. However, this position was derived from research on healthy young dogs in an experimental setting, and the relationship to human abdominal trauma patients is not clear. Furthermore, there is still no literature documenting significant hemoperitoneum in patients without abdominal pain who have a normal level of consciousness as in our case series. Nor is it clear what percentage of patients with hemoperitoneum is relatively asymptomatic when evaluated soon after their traumatic injury.

Although it is tempting to think that these patients had signs of abdominal injury missed on examination, the cases are from level 1 trauma centers that are accustomed to evaluating blunt trauma patients. Furthermore, several of the patients presented were evaluated by trauma surgeons as well as emergency physicians, and they felt that the patients did not require imaging studies of the abdomen or DPL. The ultrasound examinations performed were done so for educational purposes on patients that were essentially acting as voluntary normal controls. The detection of intraabdominal blood was a surprise in each case, and in 2 of them the discharge paperwork had to be voided. Although it is difficult to recommend scanning all blunt trauma patient based on only 6 cases, it may be prudent to use the FAST examination more liberally when the bedside technology is available. Such cases are less likely to be missed especially when...
coupled with repeat ultrasound examinations, which have a proven use as suggested in both emergency medicine and trauma literature.20,21

REFERENCES