

Abdominal trauma: Dealing with the damage

Hidden in the abdomen, life-threatening injuries can elude detection. Find out how to evaluate your patient's condition and prevent further harm.

By Cynthia Blank-Reid, RN, CEN, MSN

Often involving multiple injuries, abdominal trauma can lead to hemorrhage, hypovolemic shock, and death. Yet even a serious, life-threatening abdominal injury may not cause obvious signs and symptoms, especially in cases of blunt trauma.

To detect ominous changes in a patient's condition, you need to perform frequent, ongoing assessments and interpret your findings correctly. Key responses to decrease mortality and morbidity include aggressive resuscitation efforts, adequate volume replacement, early diagnosis of injuries, and surgical intervention if warranted.

Setting priorities

As always, your primary priorities are to maintain the patient's airway, breathing, and circulation. Next, perform a rapid neurologic examination and assess him head to toe to identify obvious injuries and signs of prolonged exposure to heat or cold. Ask the patient (or his family, emergency personnel, or bystanders) about his history— allergies, medications, preexisting medical conditions, when he last ate, and events immediately preceding or related to his injury.

If your patient sustained blunt trauma, as in a motor vehicle crash (MVC), keep his neck and spine immobilized until X-rays rule out a spinal injury. If his viscera are protruding, cover them with a sterile dressing moistened with 0.9% sodium chloride solution to prevent drying.

The following interventions are routine for a patient with abdominal trauma:

- Insert two large-bore intravenous (I.V.) lines to infuse

0.9% sodium chloride or lactated Ringer's solution, according to facility protocol.

- Control the patient's pain without sedating him, so you can continue to assess his injuries and ask him questions. Generally, I.V. analgesics such as morphine can adequately manage pain without sedation.
- Insert an indwelling urinary catheter, unless you suspect a urinary tract injury. For example, bloody urine or a prostate gland found to be in a high position during a rectal exam could indicate damage to the urinary tract. If the patient is to have a rectal examination, delay catheter insertion until afterward.
- Draw blood specimens stat for baseline lab values. (Appropriate tests are listed later in this article.)
- Insert a gastric tube to decompress the patient's stomach, prevent aspiration, and minimize leakage of gastric contents and contamination of the abdominal cavity. This also gives you access to gastric contents to test for blood.
- Administer tetanus prophylaxis and antibiotics as ordered.

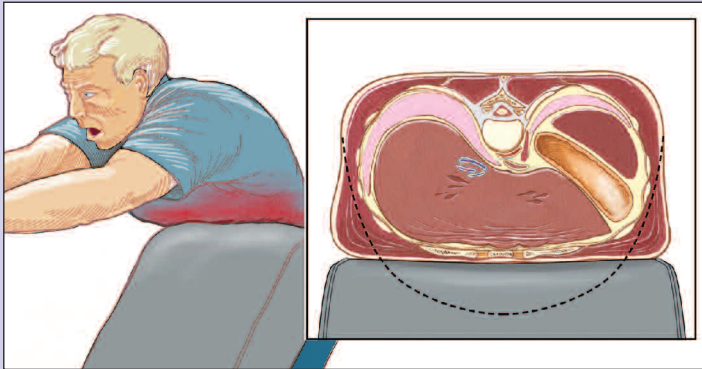
Assessing abdominal injuries

Blunt injuries suffered during an MVC can be especially difficult to detect. A penetrating abdominal injury, such as a stab wound, causes more obvious damage that commonly involves hollow organs such as the small bowel. (To review the various types of trauma, see *Forces behind abdominal injury.*)

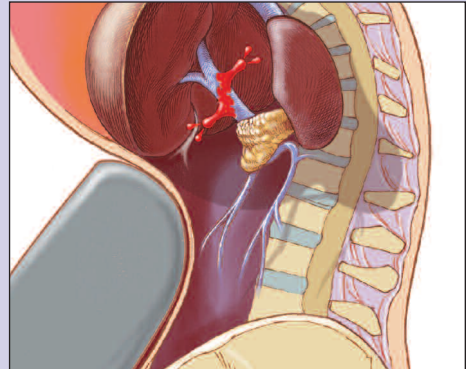
If your patient is stable, perform a complete assessment using inspection, auscultation, percussion, and pal-

Forces behind abdominal injury

Blunt trauma, a force to the abdomen that doesn't leave an open wound, commonly occurs with motor vehicle crashes (MVCs) or falls. Compression and shearing are examples.

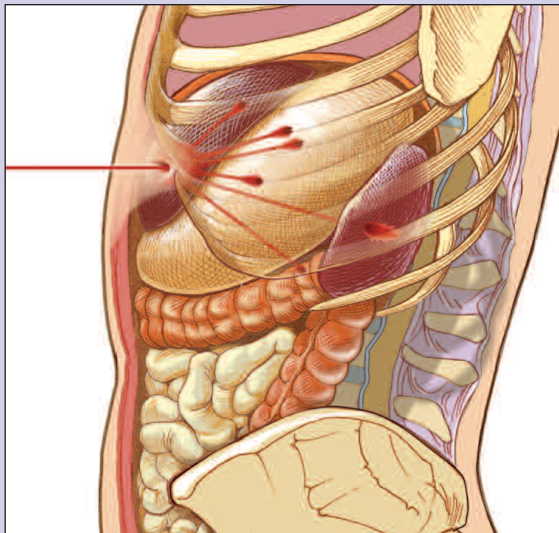


Compression is the result of a direct blow, such as being thrust against a steering wheel or seat, or with pressure from a seat belt.

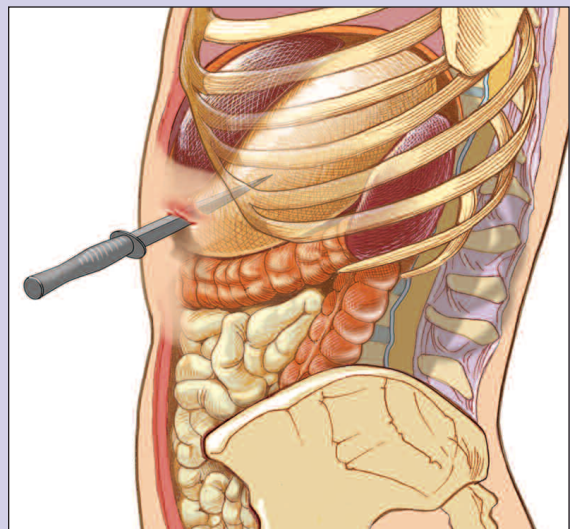


Shearing is common during rapid deceleration in an MVC as a portion of the tissue continues to move forward while another portion remains stationary. Here, the liver has torn away from the portal vein.

Penetrating trauma causes an open wound, such as from a gunshot or stabbing. The *solid organs*—diaphragm, spleen, liver, pancreas, and kidneys—can bleed profusely when injured. The *hollow organs*—stomach, gallbladder, large intestine, small intestine, and bladder—generally don't bleed significantly but damage to them is more likely to cause peritonitis.



A gunshot can damage multiple organs because of high bullet velocity or fragmenting. The patient needs surgery to repair the injured tissues and remove bullet fragments.



A stab wound is typically more localized and may be less damaging.

pation. If he's unstable, you may have to rely on inspection and auscultation alone.

Inspection. Look for and document obvious abnormalities, including distension, contusions, abrasions, lacerations, penetrating wounds, and asymmetry. If the patient was in an MVC, look for a contusion or abrasion across his lower abdomen, known as the "seat belt sign." Areas of purple discoloration should make you suspicious. Ecchymosis around the umbilicus (Cullen's sign) or flanks (Grey-Turner's sign) may indicate retroperitoneal hemorrhage, but these signs may not appear for hours or days.

Auscultation. If resuscitation efforts aren't under way, auscultate your patient's baseline bowel sounds and listen for abdominal bruits. Always auscultate before percussion and palpation because those procedures can change the frequency of bowel sounds. Listen to all four quadrants of his abdomen and his thorax.

The absence of bowel sounds could be an early sign of intraperitoneal damage. Bowel perforation and the spread of blood, bacteria, and chemical irritants can cause diminished or absent bowel sounds. Bowel sounds in the chest may signal a ruptured diaphragm with herniation of the small bowel into the thoracic cavity. Abdominal bruits (vascular sounds due to turbulent blood flow that resemble systolic heart murmurs) might signal an arterial injury or aneurysm.

Before you percuss and palpate your patient's abdomen, ask him to point to painful areas and be sure to examine them last. If his pain is severe, skip percussion and palpation; diagnostic studies such as ultrasound and computed tomography (CT) studies are necessary to evaluate his abdomen.

Percussion. In a normal abdomen, percussion elicits dull sounds over solid organs and fluid-filled structures (such as a full bladder) and tympany over air-filled areas (such as the stomach). The following findings are abnormal:

- Pain with light percussion suggests peritoneal inflammation.
- Fixed dullness in the left flank and shifting dullness in the right flank while the patient is lying on his left side (Ballance's sign) signal blood around the spleen or spleen injury.
- Dullness over regions that normally contain gas may indicate accumulated blood or fluid.
- Loss of dullness over solid organs indicates the presence of "free air," which signals bowel perforation.

Palpation. Begin gently palpating your patient's abdomen in an area where he hasn't complained of pain. Palpate one quadrant at a time for involuntary guarding, tenderness, rigidity, spasm, and localized pain. Keep in

An inside view of trauma

The following diagnostic methods are used to evaluate and classify abdominal trauma:

Ultrasound is a common tool in EDs because it's portable, noninvasive, and can be used during resuscitation. *Focused abdominal sonography for trauma (FAST)* is close to 100% specific and 98% accurate in evaluating blunt abdominal trauma. It can detect 100 ml or more of fluid or blood in the pericardium, abdomen, or pelvis and lets you visualize the spleen and liver. Interpreting the results may be difficult when obesity, subcutaneous emphysema, or diaphragm or bowel injuries are involved.

Abdominal **computed tomography (CT)** scan can reveal specific injury sites, the degree of injury and bleeding, and many retroperitoneal injuries that don't show on an ultrasound. The patient must be hemodynamically stable and cooperative so he can be moved from the ED and lie quietly for the test. A CT scan is only marginally sensitive for detecting injuries to the diaphragm, pancreas, and hollow organs and may pose additional risks if used with contrast media.

Diagnostic peritoneal lavage (DPL) usually is performed in the ED on patients who are hemodynamically unstable. A peritoneal dialysis catheter is inserted through a small incision just below the umbilicus and a liter of warmed lactated Ringer's or 0.9% sodium chloride solution is infused. Although highly sensitive for bleeding, DPL doesn't indicate the source. If you remove the fluid and it appears bloody or you can't read a paper through it, consider the results positive. False negatives are possible if the patient has adhesions or retroperitoneal hemorrhage.

Video-assisted **diagnostic laparoscopy** has helped reduce the number of laparotomies performed to evaluate abdominal trauma. The clinician inserts a tiny camera through a small incision in the abdomen to evaluate the organs. Misplacing the trocar, however, could cause an injury.

mind that these signs and symptoms might not be present if he has competing pain from another injury, a retroperitoneal hematoma, spinal cord injury, or decreased level of consciousness or if he's under the influence of drugs or alcohol. Generalized discomfort during palpation may signal peritonitis. An abdominal mass might be a collection of blood or fluid. (See "Assessing the Abdomen" in the May issue of *Nursing2003* for more on assessment techniques.)

Your patient also may need an internal examination. A rectal examination can help pinpoint injury to the urinary tract or pelvis. A vaginal examination can reveal a vaginal injury or the presence of a foreign body, such as bone from a pelvic fracture.

Signs of internal injuries

Certain telltale signs can help you sort out the many internal injuries that can occur with abdominal trauma. For example, a victim of an MVC can sustain a lap belt injury that deserves special attention. When a quick stop whips the upper torso forward, the seat belt above the bony pelvic girdle can momentarily trap the viscera against the spine and impose shearing and compression injuries to the gut and mesentery. Most common in this situation are mesenteric hematoma, devascularization of the bowel, severe damage leading to rupture of the bowel wall, bruising, and hemorrhage of the abdominal wall that follows the belt pattern.

Signs and symptoms of lap belt injury usually develop slowly and may be overshadowed by other injuries. Any MVC victim who has ecchymosis in the imprint of a seat belt on his abdomen or develops late abdominal pain, distension, paralytic ileus, or slow return of gastrointestinal function should be evaluated for abdominal injuries.

Spleen injury is usually associated with blunt trauma. Fractures of ribs 10 to 12 on the left should raise your suspicion of spleen damage, which ranges from laceration of the capsule or a nonexpanding hematoma to ruptured subcapsular hematomas or parenchymal laceration. The most serious types of injury are a severely fractured spleen or vascular tear that causes splenic ischemia and massive blood loss. (See *Pinpointing key injuries* for more details.)

Liver injury is common because of the liver's size and location. Severity ranges from a controlled subcapsular hematoma and lacerations of the parenchyma to hepatic avulsion or a severe injury of the hepatic veins. Because liver tissue is very friable and the liver's blood supply and storage capacity are extensive, a patient with liver injuries can hemorrhage profusely and may need surgery to control the bleeding.

The most common kidney injury is a contusion from blunt trauma; suspect this type of injury if your patient has fractures of the posterior ribs or lumbar vertebrae. Other renal injuries include lacerations or contusion of the renal parenchyma caused by shearing and compression forces; the deeper a laceration, the more serious the bleeding. Deceleration forces may damage the renal artery; collateral circulation in that area is limited, so any ischemia is serious and may trigger acute tubular necrosis.

Hollow organ injuries, which can occur with blunt or penetrating trauma, most commonly involve the small

bowel. Deceleration with shearing may tear the small bowel, generally in relatively fixed or looped areas.

Blunt forces cause most bladder injuries. The bladder rises into the abdominal cavity when full, so it's more susceptible to injury. If a distended bladder ruptures or is perforated, urine is likely to escape into the abdomen. If the bladder isn't full when ruptured, urine may leak into the surrounding pelvic tissues, vulva, or scrotum.

Taking a look inside

Today's technology helps pinpoint the location, nature, and severity of abdominal injuries. The medical team can use diagnostic test results to grade the patient's injuries according to several classification systems, then target treatments to specific organs,

evaluate the patient's responses, and monitor him for complications.

The approaches commonly used to diagnose and grade abdominal injuries include ultrasound, CT, diagnostic peritoneal lavage, and video-assisted laparoscopy. *An inside*

view of trauma reviews what each technique involves.

If the patient's hemodynamic status is unstable or diagnostic testing reveals a severe injury, such as a deep laceration of the liver, spleen, kidney, or pancreas, the surgeon will perform an exploratory laparotomy. He'll assess the abdomen and pelvis, then base the surgical interventions on the extent of injury, the organ involved, and the patient's other injuries, clinical condition, age, and comorbid conditions.

Lab studies shed light

The following lab work is considered basic for evaluating a victim of abdominal trauma:

- Urinalysis detects blood as a sign of urinary tract injury. A urine toxicology screen is routine to check for substances that could mask or mimic an injury. Women of childbearing age should have a urine pregnancy test as well.
- A baseline complete blood cell count can help clinicians identify injury sites, the extent of injuries, and complications. For example, an elevation in white blood cells may indicate a ruptured spleen. (See "How to Manage Spleen Trauma without Surgery" in the January issue of *Nursing2002*.) An increase in immature neutrophils (a shift to the left) may signal acute infection.

Even when the patient is bleeding, his initial hemoglobin and hematocrit results may be normal due to volume loss and hemoconcentration. Once fluid resuscitation is

Even if your initial abdominal assessments are inconclusive, maintain a high degree of suspicion and repeat your assessments for any trauma victim.

Pinpointing key injuries

	Signs and symptoms of injury	Diagnostic test abnormalities	Complications
Liver	<ul style="list-style-type: none"> • peritoneal irritation • diaphragm elevated on right side • lower right rib fracture • hypotension, tachycardia • low-to-normal central venous pressure (CVP) • right upper quadrant guarding 	<ul style="list-style-type: none"> • elevated white blood cell (WBC) count • decreased hemoglobin and hematocrit levels • elevated liver enzymes • abnormal coagulation studies, including increased clotting and prothrombin times 	<ul style="list-style-type: none"> • disseminated intravascular coagulation and other clotting problems • sepsis • pulmonary complications • intra-abdominal abscess • liver failure
Spleen	<ul style="list-style-type: none"> • pain in left upper quadrant • positive Ballance's sign • positive Kehr's sign (referred shoulder pain from blood or another irritant in the peritoneal cavity) • peritoneal irritation • hypotension, tachycardia • low-to-normal CVP • rigid abdomen 	<ul style="list-style-type: none"> • decreased hemoglobin and hematocrit levels • elevated WBC count 	<ul style="list-style-type: none"> • overwhelming postsplenectomy infection or fulminate pneumococcal bacteremia • wound infection • subdiaphragmatic abscess • pulmonary complications • hypovolemic shock • delayed hemorrhage
Pancreas	<ul style="list-style-type: none"> • epigastric pain, tenderness, guarding • Grey-Turner's sign • late signs 12 to 36 hours after injury 	<ul style="list-style-type: none"> • elevated WBC count • elevated amylase levels 	<ul style="list-style-type: none"> • cutaneous or enteric fistula • pancreatic pseudocyst • abscess • delayed hemorrhage • diabetes/pancreatic insufficiency • traumatic pancreatitis
Stomach, duodenum, mesentery, and small bowel	<ul style="list-style-type: none"> • abdominal pain, guarding • peritoneal signs of inflammation (increased pain with deep inspiration or jarring) • absent bowel sounds • blood in nasogastric tube • shock 	<ul style="list-style-type: none"> • free air on abdominal films 	<ul style="list-style-type: none"> • ileus • peritonitis • pulmonary complications • ischemic bowel syndrome • gastric fistulas
Large intestine, rectum	<ul style="list-style-type: none"> • peritonitis • pain and tenderness during rectal exam 	<ul style="list-style-type: none"> • free air on abdominal films • positive fecal occult blood test • increased WBC count 	<ul style="list-style-type: none"> • incisional infection, abscess • intestinal obstruction • colcutaneous fistula • bowel ischemia
Vascular (inferior vena cava, portal vein, and aorta)	<ul style="list-style-type: none"> • hemodynamic instability 	<ul style="list-style-type: none"> • decreased hemoglobin and hematocrit levels 	<ul style="list-style-type: none"> • thrombus • dehiscence from failed anastomosis • infection • vascular-enteric fistula
Kidneys	<ul style="list-style-type: none"> • ecchymosis over flank or 11th or 12th rib • flank or abdominal tenderness on palpation 	<ul style="list-style-type: none"> • hematuria (absence of blood in the urine doesn't rule out renal injury) 	<ul style="list-style-type: none"> • infection • renal failure

under way, hemoglobin and hematocrit values can decrease significantly, so monitor serial measurements.

A patient in hypovolemic shock may have a normal hematocrit level simply because not enough time has passed for hemodilution to occur. The best gauge of success for resuscitation or nonoperative management is the patient's clinical condition.

- Arterial blood gas analysis can reveal abnormalities such as metabolic acidosis.
- Prothrombin time, international normalized ratio, and activated partial thromboplastin time screen for coagulopathy.
- Electrolyte, blood urea nitrogen, and creatinine levels screen for underlying renal problems and provide a baseline.
- A type and crossmatch may be needed for blood replacement.
- Serum amylase and lipase levels, when persistently elevated, may indicate injury to the pancreas or bowel.

The best way to document your patient's lab values is on a flow sheet. This helps you see subtle or ambiguous changes that might go unnoticed if documented out of context with other lab reports.

Ongoing vigilance

Even if your initial abdominal assessments are inconclusive, maintain a high degree of suspicion and repeat your assessments for any trauma victim. If you note changes in his vital signs, level of consciousness, lab results, pain intensity level, or abdominal assessments, notify his primary care provider right away.

Abdominal trauma remains a serious and deadly threat. By becoming adept at identifying danger signs and changes in your patient's condition, you'll ward off potential complications and help him heal. ■

RESOURCES

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