**Abdominal Trauma**

Melissa White, MD, MPH

Arthur H. Yancey, II, MD, MPH, FACEP

**OBJECTIVES**

Upon completion of this chapter, you should be able to:

1. Identify the basic anatomy of the abdomen and explain how abdominal and chest injuries may be related.
2. Differentiate between blunt and penetrating injuries and identify complications associated with each.
3. Describe the treatment required for the patient with protruding viscera.
4. Relate how injuries apparent on the exterior of the abdomen can damage underlying structures.
5. Describe possible intra-abdominal injuries based on findings of history, physical examination, and mechanism of injury.
6. List the advanced life support interventions for patients with abdominal injuries.

**KEY TERMS**

- evisceration, p. 240
- intrathoracic abdomen, p. 238
- peritoneum, p. 240
- retroperitoneal abdomen, p. 238
- seat-belt sign, p. 240
- true abdomen, p. 238
**Chapter Overview**

Injury to the abdomen can be a difficult condition to evaluate in the hospital setting. In the field it is usually even more so. Nevertheless, because intra-abdominal injury is one of the major causes of preventable traumatic death, the possibility of intra-abdominal injury must be recognized, addressed, and documented immediately. Penetrating abdominal injuries usually need immediate surgical attention. Blunt injuries (contact sports, motor-vehicle collisions, assault) may be more subtle, but potentially just as deadly.

Whether the result of blunt or penetrating trauma, an abdominal injury may present with two life-threatening dangers: hemorrhage and infection. Hemorrhage has immediate consequences, so you must be vigilant in assessing the signs and symptoms of shock in all patients with abdominal injury. Infection, which presents late, may be just as lethal, but does not require field intervention beyond prevention of gross contamination.

The role of prehospital providers in the management of abdominal trauma has been the subject of some controversy. Studies in the mid-1980s demonstrated that appropriate and timely intervention by well-trained paramedics could improve the hemodynamic status of critically injured patients with wounds to the abdomen. More recent studies have suggested that pneumatic antishock garment (PASG) application and/or vigorous IV fluid resuscitation in the prehospital setting may do more harm than good for patients with penetrating abdominal trauma. (See Chapter 8.) The effects of aggressive fluid resuscitation in blunt trauma are less well defined.

In the field, rapid patient assessment and early treatment of shock are critical aspects in the management of the patient with abdominal trauma.

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**Case Presentation**

An advanced life support (ALS) ambulance has been dispatched to a private home for a report of a person who has “passed out.” When the team arrives at the house, they are met at the front door by a woman who says her husband had been taking a nap, and when he stood up he passed out for a few minutes. They find the man, who appears to be in his 40s, sitting in a chair. He says he is okay now, denies chest pain or history of heart disease, and is embarrassed that they were called. He appears a little pale.

They ask if they can examine him and he agrees. His pulse is 108 beats/minute, and his blood pressure is 114/90 mm Hg. When they stand him up, his pulse increases to 120 and his blood pressure drops to 90/70. He becomes light-headed but does not lose consciousness. They have him recline on the stretcher, and his examination is normal except for mild generalized abdominal tenderness. When questioned about what he has done that day, he states the only thing out of the ordinary was earlier that morning when he sparred a few rounds with his teenage son, who is to be in a karate tournament soon. He denies any significant pain other than some aching in the back of his left shoulder. What may be the cause of his syncope? What should be done to provide emergency care to this patient? Keep these questions in mind as you read the chapter. Then, at the end of the chapter, find out how the rescuers completed this call.
Anatomy of the Abdomen

The abdomen is traditionally divided into three regions: the intrathoracic abdomen, the true abdomen, and the retroperitoneal abdomen. The thoracic portion of the abdomen is located underneath a thin sheet of muscle called the diaphragm and is enclosed by the lower ribs (Figure 13-1). It contains the liver, gallbladder, spleen, stomach, and transverse colon.

The true abdomen contains the large and small intestines, a portion of the liver, and the bladder (Figure 13-2). In females, the uterus, fallopian tubes, and ovaries are considered part of the pelvic portion of the true abdomen.

The retroperitoneal abdomen lies behind the thoracic and true portions of the abdomen (Figure 13-3). It is separated by the retroperitoneal membrane from the other abdominal regions. This area includes the kidneys, ureters, pancreas, posterior duodenum, ascending and descending colon, abdominal aorta, and the inferior vena cava. Because of its location away from the anterior body surface, injuries here are difficult to evaluate in the field.

Although hemorrhage in the true abdomen may cause the anterior abdominal wall to become distended, hemorrhage severe enough to cause shock may occur in the retroperitoneal space without this dramatic sign. Furthermore, in the pelvic portion of the retroperitoneal abdomen are the iliac blood vessels. Those vessels and their branches may be damaged by abdominal trauma or pelvic fracture. Injury to this vasculature may cause serious hemorrhage with minimal localized symptoms.

Types of Injuries

Injuries to the abdomen are usually categorized as blunt or penetrating trauma, but a combination of the two also may occur. Blunt trauma is the most common mechanism of abdominal injury and has relatively high mortality rates of 10% to 30%. The reason for this is likely related to the
frequency of accompanying injuries to the head, chest, pelvis, and/or an extremity in as many as 70% of motor-vehicle collision victims.

Blunt abdominal injury may be from direct compression of the abdomen against a fixed object with resulting tears or subcapsular hematomas involving the solid organ’s associated viscera (spleen/liver). Injury also may arise from deceleration forces, with tearing of organs and their blood vessels at fixed areas within the abdominal region. This is particularly true of the liver and the renal arteries. Hollow organs (typically small intestine) may rupture due to increased intraluminal pressures.

The patient who has suffered blunt trauma may have no pain and little external evidence of injury, which may give a false sense of security. Patients with multiple lower rib fractures are notorious for having severe intra-abdominal injuries without significant abdominal pain. The severe pain from the rib fractures becomes a distracting injury for the less noticeable abdominal pain. As a result, the patient may have a poor outcome because abdominal injuries are not recognized.

Most penetrating injuries are caused by gunshot and stab wounds. Gunshot wounds to the abdomen may include direct trauma to an organ and vasculature through penetration from the bullet, its fragments, or the energy transmitted from the bullet’s mass and velocity. This is known as a blast effect.

As a general rule, most patients with gunshot wounds to the abdomen will be definitively treated in the operating room. These patients have mortality rates of between 5% and 15% because of a greater incidence of injury to abdominal viscera from the higher energy imparted to the intra-abdominal organs. (See Chapter 1.)

The mortality rate from abdominal stab wounds is relatively low (1% to 2%). Unless the knife penetrates a major vessel or organ, such as the liver or spleen, the patient may not initially appear to be in shock at the scene. However, some patients can develop life-threatening peritonitis over the next few hours or days. Those wounds need to be carefully explored in the emergency department because approximately one-third of stab-wound patients require surgery for intra-abdominal bleeding.

Because the path of the penetrating object might not be readily apparent from the wound location, any penetrating wound of the chest may penetrate the abdomen, and vice versa. The course of a bullet may pass through numerous structures in different body locations. It is important to look at the patient’s entire posterior surface because penetrating trauma in the gluteal area (iliac crests to the gluteal folds, including the rectum) is associated with up to a 50% incidence of significant intra-abdominal injuries.

**Assessment and Stabilization**

**Scene Size-up**

You can glean important information from the scene by noting the circumstances surrounding the patient’s injury. An accurate but rapid assessment of the scene will usually tip you off to the possibility of intra-abdominal trauma. Do circumstances on the scene suggest that the victim has fallen from a height or been hit by a passing vehicle? Has there been an explosion that could have hurled the victim against immobile objects or transmitted blast pressure to organs inside the abdomen? Has the victim of an automobile crash had the shoulder strap under the arm rather than over the shoulder? Or was the lap belt worn too high over
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the soft true abdomen instead of correctly across the pelvis? Any of those mechanisms can lead to abdominal injury.

If the patient was involved in a motor-vehicle crash, as you do your scene size-up, quickly observe the damage to the vehicle, such as passenger compartment intrusion, airbag deployment, broken windows, bent steering wheel/steering column, and location of occupants. If the patient needs to be extricated, note the location of the safety belts. Although they certainly save lives, safety belts incorrectly worn can cause blunt abdominal injuries by compressing the intra-abdominal organs against the spine. Remember that lap belts alone, especially in the young adolescent age group may, ironically, predispose an individual to intra-abdominal injuries.

The patient who is stabbed or shot may be able to give you some idea of the size of the instrument or trajectory of the bullet. With gunshot wounds, it is also important to know the caliber, the range from which it was fired, and the number of rounds that were fired. A bystander or the police may be able to provide such information. On arrival at the hospital (optimally, a trauma center), be sure to report any mechanism that suggests abdominal injury. However, while at the scene, it is important not to spend a great deal of time attempting to obtain a history. The major cause of preventable mortality in abdominal trauma is delayed diagnosis and treatment.

**Patient Assessment**

As in treating any other traumatic condition, the patient should first undergo the ITLS Primary Survey. During the rapid trauma survey the essence of theprehospital abdominal exam is rapid visualization and palpation of both the chest and abdomen. Quickly inspect the chest and abdomen for deformities, contusions, abrasions, and punctures (DCAP), evisceration, and distention. The chest is only one thin muscle sheet (the diaphragm) away from the abdominal cavity.

Abdominal organs are enclosed within the lower ribs, thus injury to both chest and abdomen is not uncommon. Blunt or penetrating injuries to the chest from about the nipple line (fourth or fifth ribs) down should make you suspicious for both chest and abdominal injuries. Rib fractures may suggest hepatic, splenic, and diaphragmatic trauma. Splenic injury may present with referred left posterior shoulder pain, and a liver injury may present with referred right posterior shoulder pain. The presence of a seat-belt sign, a large bruise or abrasion across the abdomen, is indicative of intra-abdominal injury in approximately 25% of cases. Periumbilical bruising (Cullen’s sign) may raise suspicion for retroperitoneal hemorrhage, but be mindful that this finding usually takes several hours to develop.

Palpate the patient’s abdomen for distention, tenderness, or rigidity. Distention of the abdomen should be interpreted as a sign of severe intra-abdominal trauma with likely hemorrhage. Tenderness or guarding over the abdominal wall is also usually a sign of intra-abdominal injury. If tenderness or guarding is present in the prehospital setting, there is usually significant blood in the abdomen causing irritation of the peritoneum. This is an indication that shock may be imminent. (See Chapter 8.) Gentle palpation of the iliac crests (pelvic wings) and pubis of the pelvis may reveal the tenderness or bony crepitation associated with fractures. Pelvic fractures frequently result in hemorrhagic shock. The genitalia should be visualized for bruising or hemorrhage during the ITLS Secondary Survey.
Auscultation of the abdomen in the field usually does not offer further useful information. Abdominal wounds should never be probed with your finger or with an instrument. If clothing must be removed to visualize injury, try to preserve important potential legal evidence by cutting around (rather than through) areas that have signs of possible penetration.

**Stabilization**

Interventions should follow priorities established by the ITLS Primary Survey. They should proceed in the same order in which assessment occurred: (A) airway, (B) breathing, and (C) circulation. (This only changes to CABC if there is obvious severe uncontrolled external hemorrhage.) For the patient in whom you suspect only intra-abdominal injury, you would still give high-flow oxygen by the most appropriate method and be sure breathing was adequate before dealing with the circulatory issue of shock or potential shock.

The patient should be readied for immediate transport with appropriate spinal motion restriction (SMR). (Penetrating trauma to the abdomen or chest with no signs of neurological deficit should not have SMR because time is extremely critical.) Once en route to an appropriate facility, establish two large-bore IV lines of normal saline. If the patient’s blood pressure drops below 90 mm Hg systolic with signs of shock, then the IV fluids should be given at a rate to maintain the systolic blood pressure at 80 to 90 mm Hg. (See Chapter 8.) It is thought that aggressive fluid resuscitation might dislodge protective clots and/or dilute clotting factors, both of which lead to worsening hemorrhage.

Gently cover any organ or viscera protruding from a wound with gauze moistened with saline or water. If you have a long transport time, you can apply a nonadherent material, such as plastic wrap or aluminum foil, to prevent drying of the gauze and intestines (Scan 13-1). If the intestines are allowed to dry, they may become irreversibly damaged. Do not push abdominal contents protruding from a wound back into the abdomen. Similarly, if a foreign body (such as a knife or glass shard) is impaled in the abdomen, do not attempt to remove or manipulate it because it may precipitate uncontrollable hemorrhage. Carefully stabilize the object in place without moving it. (Pregnant patients deserve the special considerations addressed in Chapter 19.)

**Areas of Current Study**

Deciding which patient should be taken to a local community hospital and which should be taken directly to a trauma center can be a difficult decision, with only a patient history, a scene size-up, and a patient assessment to guide it. Better tools are needed to distinguish between patients who have injuries that are either not severe or not time critical and will remain stable, and those with a significant mechanism of injury who appear stable initially, and then decompensate later, requiring emergent transfer to a trauma center. Tests performed quickly in the ambulance or on scene that could help predict which apparently stable patient might deteriorate would be very helpful. Current studies using finger-stick serum lactate levels and studies using abdominal ultrasound in the field (F.A.S.T. exam) show some promise. (See Chapter 2 for more about those studies.)
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SCANT 13-1  Caring for an Evisceration

1. Remove clothing to fully expose the abdominal wound.

2. Cover the wound with a sterile dressing soaked with normal saline.

3. Cover the moistened dressing with a sterile occlusive dressing to prevent evaporative drying.

CASE PRESENTATION  (continued)

An advanced life support (ALS) ambulance has been dispatched to a private home for a report of a person who has “passed out.” They find a man who has postural hypotension (blood pressure drops and pulse rises when going from supine to standing position), a slightly tender abdomen, and some aching in the back of his left shoulder. His history is negative for any serious illnesses, and he takes no medications. He has not eaten since a light
breakfast six hours ago. A 12-lead ECG shows slight tachycardia but is otherwise normal. He admits to getting “beat up a little” by his son when they practiced karate two hours before.

With the combination of postural hypotension post-trauma, slightly tender abdomen, and pain in posterior left shoulder (no tenderness), the team leader is suspicious of a traumatic splenic rupture. The team leader explains the danger to him, and he agrees to go to the hospital for evaluation. An IV line is started on the way to the trauma center, but fluids are kept at KVO rate because the supine blood pressure is 110/90 mm Hg. A CT scan at the trauma center revealed a tear of the spleen and blood in the abdomen. The patient has a complete recovery after surgery.

**Summary**

Effective prehospital management of the patient with abdominal trauma entails the following:

- Scene size-up for mechanisms of injury and pertinent history from the patient and/or witnesses
- Rapid patient assessment
- Rapid transport to the appropriate hospital (optimally, a trauma center)
- IV lines and other interventions as needed (usually performed en route)

The enemies of the abdominal trauma patient are bleeding and time elapsed from injury until optimal care. If you can minimize on-scene delays, you will help to maximize the patient’s chance for survival.

**Bibliography**


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