

# **Basic Athletic Training**

## **Course Pack D**

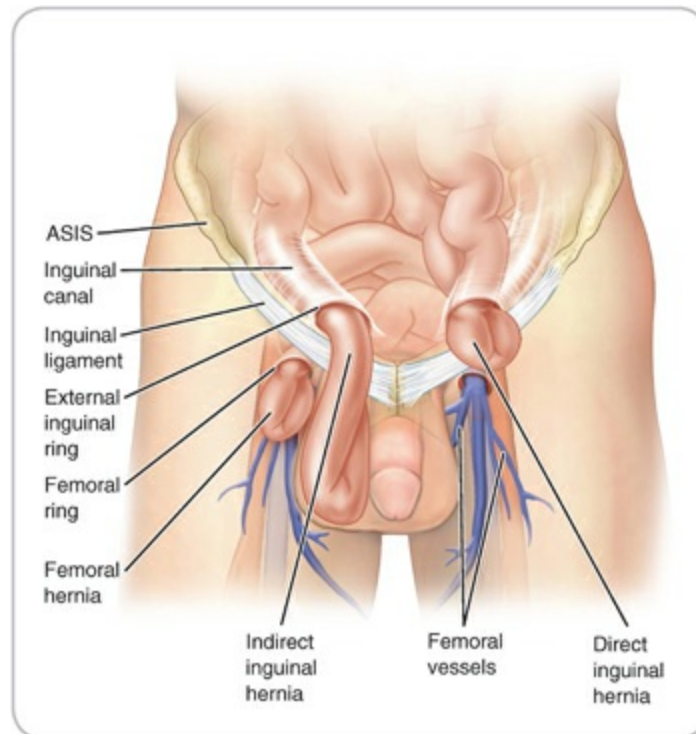
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For use in PES 385, Basic Athletic Training, SUNY Brockport.

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**Figure 23.20. Hernias.** A hernia may be classified as indirect (A), in which the small intestine extends into the scrotum; direct (B), in which the small intestine extends through a weakening in the internal inguinal ring; or femoral (C), in which the small intestine protrudes posterior to the inguinal ligament and medial to the femoral artery. ASIS, anterior superior iliac spine.

An indirect inguinal hernia is the most common type of hernia in young athletes. A weakness in the peritoneum around the deep inguinal ring allows the abdominal viscera to protrude through the ring into the inguinal canal and, occasionally, even extend into the scrotum. This weakness in the peritoneum typically is not present in women. Large indirect hernias may reduce spontaneously, because they cannot extend easily into the inguinal canal. Direct hernias, which tend to be more common in men older than 40 years of age, result from a weakness in an area of fascia bounded by the rectus abdominis muscle, the inguinal ligament, and the epigastric vessels. Femoral hernias, more commonly seen in women, allow the abdominal viscera to protrude through the femoral ring into the femoral canal, compressing the lymph vessels, connective tissue, and femoral artery and vein. The herniation presents as a mass that is inferolateral to the pubic tubercle and medial to the femoral artery and vein.

The danger of a hernia lies in continued trauma to the weakened area during falls, blows, or increased intra-abdominal pressure exerted during activity. The hernia can twist on itself and produce a strangulated hernia, which can become gangrenous.

### *Signs and Symptoms*

Symptoms vary, but in most cases, the first sign of a hernia is a visible, tender swelling and an aching feeling in the groin. Some hernias are asymptomatic until the preparticipation examination, when the physician palpates the protrusion by invaginating the scrotum with a finger. Protrusion of the hernia increases with coughing.

### *Management*

Most hernias require surgical repair. Individuals with an indirect hernia repair can begin walking, mild upper extremity exercises, and bicycling within 6 weeks of surgery. A return to noncontact sports participation can occur in 7 weeks, and a return to contact sports can occur within 8 to 10 weeks.

Repair of direct inguinal and femoral hernias is more extensive. Strenuous activities are prohibited for 3 weeks postsurgery. A return to noncontact sports can occur in 8 weeks, and a return to contact sports can occur in 12 weeks. Activities that stretch or pull the abdominal muscles should be avoided. Recommended activities include swimming, biking, and weight training for the upper extremities.

In some situations, an individual with a hernia that has not been repaired can participate in noncontact sports. Surgical repair is recommended to prevent recurrent, irreducible hernias, however, which can lead to a small bowel obstruction.



The ice hockey player experiencing dyspnea following a blow to the abdomen is believed to have sustained a solar plexus contusion. The management of this condition includes assessing the airway for obstruction, removing any mouth guard or dental apparatus, loosening restrictive equipment around the abdomen, and having the patient flex

his knees toward his chest. If breathing does not return to normal within a few minutes, the emergency plan, including summoning EMS, should be activated.

## INTRA-ABDOMINAL CONDITIONS



A 22-year-old lacrosse player was struck in the abdomen with an opponent's stick. She experienced a sudden onset of abdominal pain in the upper right quadrant. She also reported pain to the inferior angle of the right scapula. What injury should be suspected, and how should this condition be managed?

Trauma to the abdomen can lead to severe internal hemorrhage if organs or major blood vessels are lacerated or ruptured. Injuries can be open or closed, with closed injuries typically caused by blunt trauma. If damaged, hollow viscera can leak their contents into the abdominal cavity, causing severe hemorrhage, **peritonitis**, and shock. Many signs and symptoms indicating an intra-abdominal injury, regardless of the organ involved, are similar in nature ([Box 23.7](#)). Variations arise in the area of palpable pain and the site of referred pain.

### **BOX 23.7** Common Signs and Symptoms of Intra-abdominal Pathology

- Abdominal pain
- Abdominal tenderness and/or rigidity
- Presence of rebound tenderness
- Abdominal distention
- Absent or diminished bowel sounds
- Nausea and/or vomiting
- Hematuria

- Fever
- Shock

Acute management of suspected intra-abdominal injuries also is very similar, regardless of the injured organ. Initially, the clinician should keep the individual relaxed while assessing the airway, breathing, and circulation. If necessary, the emergency medical plan, including summoning EMS, should be activated. While waiting for EMS to arrive, the individual should be placed in a supine position with the knees flexed to relax the low back and abdominal muscles. The vital signs should be monitored regularly, and the individual should be treated for shock. [Application Strategy 23.2](#) summarizes the acute management of intra-abdominal injuries.

## APPLICATION STRATEGY 23.2

### Management Algorithm for Suspected Intra-abdominal Injuries

#### **In case of vomiting:**

Roll the person on the side to allow drainage.

Make certain the airway remains open.

Control any external hemorrhage with pressure and a sterile dressing.

Lay the patient supine:

- Keep the knees flexed to relax the abdominal muscles.
- Do not extend the legs or elevate the feet.

Record vital signs:

- Respiratory rate and depth (rapid, shallow breathing indicates shock)
- Pulse rate and strength (rapid, weak pulse indicates shock)
- Blood pressure (a marked drop in both readings indicates shock)
- Pupillary response to light (lackluster, dilated pupils indicates shock)

Do not give anything by mouth to the patient.

Treat for shock and monitor vital signs until EMS arrives.

# Splenic Rupture

## *Etiology*

Although the spleen rarely is injured in sport participation, certain systemic disorders, such as infectious mononucleosis, can enlarge this organ, making it vulnerable to injury. The spleen is the most commonly injured abdominal organ and is the most frequent cause of death from abdominal blunt trauma in sports.<sup>8</sup> Subsequent to trauma, the spleen can lose blood very rapidly because of its vascularity; however, the spleen can splint itself and stop hemorrhaging. This may appear to be advantageous, but it actually is problematic because the splinting is not sufficient and a delayed hemorrhage can be produced days, weeks, or even months later after a seemingly minor jarring motion.

An individual who has infectious mononucleosis should be disqualified from contact and strenuous noncontact sports and physical activity for at least 3 weeks. After 3 weeks, a return to strenuous noncontact sports and physical activity is acceptable if the individual feels up to the activity, the spleen is nonpalpable, and the liver function tests are normal. If the spleen remains palpable or the liver function tests are abnormal, contact sports and activities are contraindicated for an additional week or longer.<sup>19</sup>



Activate the emergency medical plan, including summoning EMS.

## *Signs and Symptoms*

Indications of a splenic rupture include a history of blunt trauma to the left upper quadrant and a persistent, dull pain in the upper left quadrant, left lower chest, and left shoulder, which is referred to as the **Kehr sign**. This referred pain, which is seen in nearly 60% of patients with a splenic injury, is caused by irritation of the diaphragm innervated by the phrenic nerves, which arise from the ventral rami of segments C3–C5.<sup>20</sup> The free blood also can irritate the right side of the diaphragm, in which case pain is referred to the dermatome patterns in the right shoulder. Symptoms at the time of injury include nausea, cold and clammy skin, and signs of shock.

## Management

Treatment usually involves nonoperative intravenous therapy, strict bed rest, and intensive monitoring of vital signs. Because the spleen is essential to the body's immune system function, it is important to protect the individual by administering additional immunizations and considering the needs of an immunocompromised system. Physical activities should be restricted for at least 2 weeks. A return to vigorous physical activity is not recommended until 2 to 3 months after injury. If surgical repair is indicated, a minimum period of 3 months is needed for the abdominal musculature to heal and regain adequate strength before a return to vigorous activity. Most physicians recommend a 6-month interval after a splenectomy before an individual returns to contact sports.

If splenic injury is suspected, activation of the emergency plan, including summoning EMS, is warranted. While waiting for EMS to arrive, the clinician should maintain the airway, assess vital signs, and treat for shock as necessary. Refer to [Application Strategy 23.2](#) for further management procedures.



## Liver Contusion and Rupture

### *Etiology*

A direct blow to the upper right quadrant can contuse the liver. As with the spleen, systemic diseases, such as hepatitis, can enlarge the liver, thus making it more susceptible to injury.

If a liver injury is suspected, activation of the emergency plan, including summoning EMS, is warranted. While waiting for EMS to arrive, the clinician should maintain the airway, assess vital signs, and treat for shock as necessary.



### *Signs and Symptoms*

Significant palpable pain, point tenderness, hypotension, and shock are indicative of liver trauma. In addition, pain may be referred to the inferior angle of the right scapula.

## Management

An individual with a liver contusion should be referred immediately to a physician for diagnosis and treatment. An individual with an enlarged liver (i.e., hepatomegaly) should avoid contact sports until the liver has returned to its normal size or is nonpalpable. If lacerated, the liver is capable of massive bleeding; however, the bleeding typically stops by the time the wound is exposed during surgery. For this reason, there has been an increasing trend toward nonoperative management.<sup>21</sup> Refer to [Application Strategy 23.2](#) for further management procedures.

## Appendicitis

### *Etiology*

The vermiform appendix is a pouch extending from the cecum (see [Fig. 23.7](#)). If it becomes obstructed (e.g., with hardened fecal material), venous circulation can become impaired, leading to increased bacterial growth and the formation of pus. The resulting inflamed appendix, a condition called **appendicitis**, can lead to ischemia and gangrene. If the appendix ruptures, feces and bacteria are sprayed over the abdominal contents, causing peritonitis.

The patient needs to be referred for examination. In some cases, such as the presence of shock, vomiting, and diarrhea, activation of the emergency plan, including summoning EMS, is warranted. While waiting for EMS to arrive, the clinician should maintain the airway, assess vital signs, and treat for shock as necessary. Refer to [Application Strategy 23.2](#) for further management procedures.



### *Signs and Symptoms*

Abdominal pain 2 to 7 days prior to the actual presentation of the condition is the most common symptom of acute appendicitis. Often, there is a history of classic migratory pain (initial periumbilical or epigastric pain) localizing to the right lower quadrant.<sup>22</sup> Rebound pain can be elicited at the McBurney point ([Fig. 23.15](#)), which is one-third the distance between the anterior superior iliac spine and the umbilicus. Other symptoms that may be present include a loss of appetite, nausea, vomiting, diarrhea, and low-grade fever.



## *Management*

If the patient presents with symptoms consistent with more advanced stages, such as the presence of shock, vomiting, and diarrhea, the individual should be referred immediately to an acute medical facility. Surgical intervention is often required to remove the appendix.

## Renal and Genitourinary Conditions

The kidneys are located in the retroperitoneal upper lumbar area of the abdomen. The upper third of the right kidney and upper half of the left kidney are located under the 12th rib. Posteriorly, the organs are protected by the psoas, paravertebral, and latissimus dorsi muscles and are encased in pericapsular fat. Despite this protection, the kidneys can be injured when the body is extended and the abdominal muscles are relaxed, such as when a receiver leaps to catch a pass. The ureters run along the posterior peritoneal wall and are at risk for injury where they cross the bony rim of the pelvis. The bladder lies with the pelvis and is more vulnerable to injury when full. Several chronic and acute conditions can affect these organs.

## *Kidney Contusion*

### ■ **Etiology**

The kidney may be injured as a result of a direct blow or a contrecoup injury from a high-speed collision. Because the kidney normally is distended by blood, an external force can cause an abnormal extension of the engorged kidney. The degree of renal injury depends on the extent of the distention and on the angle and magnitude of the blow.

### ■ **Signs and Symptoms**

The individual may complain of pain, tenderness, and **hematuria**. Pain can be referred posteriorly to the low back region, to the sides of the buttocks, and anteriorly to the lower abdomen. Hypovolemic shock may result from extensive bleeding.

## ■ Management

Treatment involves applying ice to control inflammation and pain, treating for shock, and if needed, transporting the individual to the nearest medical facility. A radiograph or computed tomographic scan may be used to determine the extent of the injury. Most injuries are handled conservatively, with rest and fluid management. Spontaneous healing and a return of normal renal function can be expected. Individuals, who have a solitary kidney, especially when the kidney is pelvic, iliac, polycystic, or anatomically abnormal, should be counseled about the increased risk of injury. Although contact sports place the remaining kidney at very little risk, participation in contact or collision sports should be individually assessed. Use of a flak jacket or other customized padding may reduce the incidence of injury during contact or impact sports.

## *Kidney Stones*

### ■ Etiology

Some substances filtered by the kidneys (especially calcium, oxalate, uric acid, and cystine) have a tendency to form crystals. Other substances (e.g., citrate and magnesium) help to prevent crystal formation. When these substances are not in balance, the urine becomes too concentrated, acidic, or alkaline, and crystals can form. Risk factors for this condition include a family history of kidney stones, being a white male between 20 and 40 years of age, certain diseases (e.g., gout, chronic urinary tract infections [UTIs], cystic kidney disease, hyperparathyroidism, renal tubular acidosis, and cystinuria), certain medications (e.g., diuretics), having only one kidney, eating a diet high in protein and low in fiber, a lack of adequate water intake, and living a sedentary lifestyle. In some cases, however, the exact cause of kidney stones may be unknown (i.e., idiopathic nephrolithiasis).

There are four main types of kidney stones, each stemming from a different cause:

- **Calcium stones.** Most kidney stones are formed from calcium (85% in men; 65% in women).<sup>20</sup> These stones may result from large amounts of vitamin D, which may cause the body to absorb too much calcium; drugs, such as

thyroid hormones and some diuretics; certain cancers; overactive parathyroid glands; and some kidney conditions.

- **Uric acid stones.** As the name suggests, these stones are formed from uric acid, a byproduct of protein metabolism. A diet high in meat may cause excess amounts of uric acid in the urine. These stones also have been attributed to chemotherapy treatment.
- **Struvite stones.** Found mainly in women, struvite stones almost always are the result of chronic UTIs caused by bacteria that secrete specific enzymes. These enzymes increase the amount of ammonia in the urine, which makes up the crystals in struvite stones. These stones often are large and have a characteristic stag's horn shape, which can cause serious damage to the kidneys.
- **Cystine stones.** These stones represent approximately 1% of kidney stones. They form in people with a hereditary disorder that causes the kidneys to excrete excessive amounts of certain amino acids (cystinuria).

Over time, these crystals may combine to form a small, hard mass. In some cases, this mass or stone breaks off and passes into the ureter, eventually traveling to the bladder for expulsion.

## ■ Signs and Symptoms

Individuals may be asymptomatic until the kidney stone is large enough (>7 mm) to cause a blockage or infection. Then, an intense, colicky pain begins suddenly and intensifies over 15 to 30 minutes. The pain usually starts in the back or flank, just below the edge of the ribs, and moves anteriorly toward the groin as the stone moves down the ureter toward the bladder. If the stone stops moving, the pain may stop. Other signs and symptoms may include bloody, cloudy, or foul-smelling urine; nausea; vomiting; a persistent urge to urinate; and, if an infection is present, fever and chills.

## ■ Management

Treatment varies depending on the type of stone and on the cause. Individuals may be able to move the stone through the urinary tract simply by drinking as

much as 2 to 3 quarts of water per day and by staying physically active. If the stones are too large to pass on their own or cause bleeding, kidney damage, or an ongoing UTI, surgical intervention with an extracorporeal shock wave lithotripsy may be necessary. Extracorporeal shock wave lithotripsy uses shock waves to break the stones into small crystals, which can then be passed in the urine. Following treatment, it may take several months for all the stone fragments to pass.

## *Urinary Tract Infections*

### ■ **Etiology**

A UTI describes any infection that begins in the urinary system. Although many cases are simply painful and annoying, the condition can become a serious health problem if the infection spreads to the kidneys. Although any structure in the genitourinary system can be infected, most infections occur in the lower tract.

**Cystitis** (inflammation of the bladder) and **urethritis** (inflammation of the urethra) are the most common UTIs. Most cases are caused by *Escherichia coli*, which ascend the urinary tract from the opening in the urethra. The bacteria also may be introduced during urinary tract catheterization. In addition, urethritis can be caused by sexually transmitted organisms, such as *Chlamydia trachomatis* and *Neisseria gonorrhoeae*, which are the agents of chlamydia and gonorrhea, respectively. Women are 10 times more likely than men to have ascending UTIs, except when compared to men older than 50 years of age, largely because women have a shorter urethra. Sexually active women also are more susceptible to cystitis, because sexual intercourse enhances bacterial transfer from the urethra into the bladder.

### ■ **Signs and Symptoms**

Signs and symptoms may not be indicative regarding the severity of the condition. Some individuals may present with very few symptoms yet have significant **bacteriuria**. An individual with cystitis may complain of pain during urination (i.e., **dysuria**), urinary frequency and urgency, and pain superior to the pubic region. Cloudy, bloody, or foul-smelling urine also may

be noted. An individual with urethritis may present similar symptoms, with the exception that the quality of the urine often is not affected. Other symptoms, such as high fever, shaking, chills, nausea, vomiting, and low back pain, may indicate a simultaneous upper UTI of the kidney (i.e., **acute pyelonephritis**). Urinalysis may reveal elevated levels of leukocytes, nitrates, and higher pH levels.

## ■ **Management**

Referral to a physician is necessary because a urine culture is required to identify the organism responsible for the infection. Subsequently, medication in the form of antibiotics and sulfa drugs is prescribed to treat the infection. Symptoms usually will clear within a few days of treatment, but it is critical to take the entire course of medication to ensure that the infection is completely eradicated. A longer course of antibiotic treatment may be recommended with recurrent UTIs. In addition, increased clear fluid intake may be recommended to promote urinary outflow. Analgesics, urinary antiseptics, and antispasmodics also may be prescribed for the relief of pain and bladder spasms.

## *Hematuria*

### ■ **Etiology**

Blood in the urine (i.e., **hematuria**) can be macroscopic, gross, or microscopic. The condition may be caused by a direct kidney injury, bladder contusion, UTI, drug or medication use, “march” or foot-strike hemolysis, infection, sickle cell disease, rhabdomyolysis, or preexisting pathology. Nontraumatic renal hematuria, referred to as athletic pseudonephritis, is characterized by decreased renal blood flow that leads to ischemia in the kidney and the subsequent passage of red blood cells. Traumatic renal hematuria involves obvious direct contact or indirect trauma from repetitive jarring during running or jumping. Traumatic bladder hematuria is believed to result from repetitive contact of the posterior bladder wall against the base of the bladder. Most participants in sports and physical activity void before

activity. Running with an empty bladder increases the risk of gross hematuria (i.e., visible blood in the urine) because no fluid cushion exists between the posterior wall and the base of the bladder. This condition commonly is seen in long-distance runners, hence the name runner's bladder. Hematuria caused by running resolves within 24 to 48 hours of rest.

### ■ Signs and Symptoms

Massive external trauma associated with pelvic fractures can seriously damage the bladder, leading to lower abdominal pain and tenderness. Bruising in the lower abdominal region may be visible. Palpation may reveal abdominal tenderness, muscle guarding, or rigidity. An individual with a bladder contusion is able to void, and gross or microscopic hematuria is present. An individual with a bladder rupture usually is unable to void, and a specimen obtained by a catheter reveals blood in the pelvic cavity.

### ■ Management

Physically active individuals with benign hematuria secondary to exercise may continue to be active but should be encouraged to drink quantities of clear fluids before, during, and after exercise to avoid dehydration. Small amounts of urine should be maintained in the bladder during exercise to cushion against repetitive trauma. If gross or microscopic hematuria persists, referral to a physician is necessary. Additional tests may be necessary to rule out serious underlying conditions, such as renal disease, sickle cell anemia, and urine cytology.

## *Proteinuria*

### ■ Etiology

In the kidney, blood filtration occurs primarily in the glomeruli, which are microscopic, raspberry-shaped tangles of blood vessels. The glomeruli permit small molecules, such as waste products, to escape from the bloodstream into the urine for removal from the body while keeping larger molecules, such as useful proteins, in circulation. Normal protein excretion is 30 to 45 mg per

day. Elevated levels of protein, primarily albumin, are thought to occur in as many as 70% of competitive athletes after exertion.<sup>23</sup> Other conditions that may lead to elevated protein levels include dehydration, heat-related illness, fever, emotional stress, inflammatory conditions, some acute illnesses (e.g., diabetes, hypertension, and some kidney diseases), orthostatic (postural) disorder, pregnancy, and regular high-protein diets.

Excessive protein in the urine ( $\geq 150$  mg per day) may indicate early signs of renal disease. In the United States, diabetes is the leading cause of end-stage renal disease. In both type 1 and type 2 diabetes, the first sign of deteriorating kidney function is minute amounts of albumin in the urine, a condition called **microalbuminuria**. As kidney function declines, levels of albumin in the urine increase, and microalbuminuria becomes full-fledged proteinuria.

Hypertension is the second leading cause of end-stage renal disease and, if not controlled, can progress to renal failure. African Americans in the age range of 20 to 49 years are 20-fold more likely than their white counterparts to develop hypertension-related kidney failure. Other groups at risk for proteinuria are American Indians, Hispanic Americans, Pacific Islander Americans, older people, and overweight people.<sup>24</sup> People with a family history of kidney disease should have their urine tested regularly.

## ■ Signs and Symptoms

Albumin functions to retain fluid in the blood by acting like a sponge to soak up fluid from body tissues. Because the protein has been excreted, blood can no longer soak up enough fluid, leading to noticeable swelling in the hands, feet, abdomen, or face. Large amounts of protein in the urine may cause it to look foamy in the toilet. More commonly, however, no signs or symptoms are noticeable.

## ■ Management

Testing a urine sample with a chemically treated dipstick is the only way to determine the amount of protein in the urine. In the absence of protein, the dipstick panel is yellow; proteins in the solution interfere with the dye–buffer combination, causing the panel to turn green. Exertional proteinuria usually

reads 2+ to 3+ by dipstick measurement within 30 minutes of exercise but clears in 24 to 48 hours. Evidence suggests a direct relationship between the intensity of exercise and the amount of proteinuria.<sup>23</sup> False-positive results can occur under the following conditions:

- Alkaline urine (pH >7.5)
- Dipstick immersed too long
- Highly concentrated urine
- Gross hematuria
- Presence of penicillin, sulfonamides, or tolbutamide
- Presence of pus, semen, or vaginal secretions

False-negative results can occur with dilute urine and when the urinary proteins are nonalbumin or of low molecular weight.<sup>24,25</sup> Because the results of urine dipstick analysis are a crude estimate for the urine protein concentration, individuals with positive findings should be referred to a physician for a more complete evaluation. More sensitive tests for protein or albumin in the urine are recommended for individuals at risk of kidney disease, especially those with diabetes. If a laboratory test shows high levels of protein, the test should be repeated 1 to 2 weeks later. If the second test also shows high levels, additional tests should be conducted to evaluate kidney function.

A physician may prescribe an angiotensin-converting enzyme inhibitor or an angiotensin-receptor blocker for an individual with diabetes or hypertension. These drugs have been found to protect kidney function even more than other drugs that provide the same level of blood pressure control. A restriction of dietary salt and protein intake also may be recommended.<sup>24</sup>



The lacrosse player had a history of direct trauma to the upper right quadrant of the abdomen. In addition to pain at the site of the trauma, she reported pain to the inferior border of the right scapula. This history suggests a possible liver contusion or rupture. This condition warrants activation of the emergency medical plan, including



summoning EMS.

## INJURIES AND CONDITIONS OF THE GENITALIA

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While attempting to tag a sliding base runner, a baseball player was struck in the groin by an opponent's foot. He immediately fell to the ground and drew his knees to the chest while grasping the genital region. What possible conditions can occur as a result of direct trauma to the genitalia? What signs and symptoms indicate that an immediate referral to a physician is warranted?

The male genitalia are more susceptible to injury than female genitalia because several structures are external to the body and, as such, are exposed to direct trauma. Protective cups can protect the penis and scrotum from injury. Direct trauma can damage the penis, urethra, and scrotum, which holds the testes. In addition, congenital variations in testicular suspension make certain individuals susceptible to torsion of the testicle.

### Male Genital Injuries

Direct trauma to the groin can cause severe pain and dysfunction to the testes and penis. Lacerations are rare, but swelling and hemorrhage inside the scrotal sac can occur. As part of the follow-up management of an injury to the male genital organs, the individual should be instructed to perform a periodic self-assessment for pain and swelling and be provided with guidelines on seeking further medical care if necessary.

### *Penile Injuries*

#### ■ **Etiology**

Superficial wounds to the penis may involve a contusion, abrasion, laceration, avulsion, or penetrating wound. In addition, the urethra can be damaged.

Cyclists may develop transient paresthesia of the penis as a result of pressure on the pudendal nerve.

### ■ Signs and Symptoms

Extreme pain and discomfort will be present, with associated bleeding from the wound.

### ■ Management

Most injuries resolve without specific treatment. Superficial bleeding should be controlled by applying a cold compress. Referral to a physician is only necessary if the hemorrhage persists or if swelling impairs the function of the urethra, leading to an inability to void. Adjusting the saddle height, tilt, and number of cycling bouts usually resolves the condition. Rising up on the pedals also can relieve pressure temporarily.

## *Scrotal Injuries*

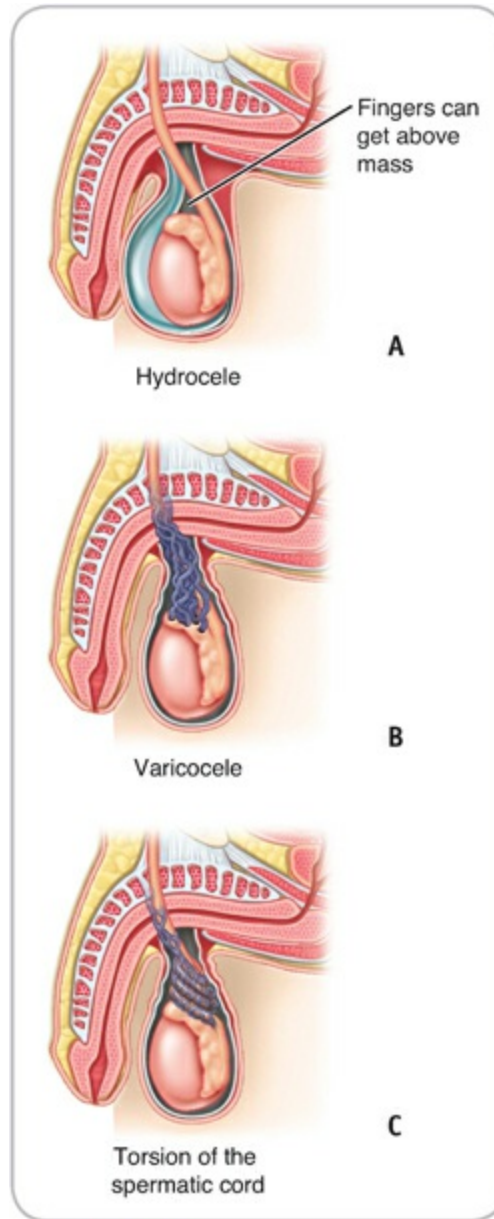
### ■ Etiology

Blunt scrotal trauma can cause a contusion, hematoma, torsion, dislocation, or rupture of a testicle. If the tunica vaginalis ruptures, the vascular and tubercle components of the testes can be seriously damaged.

### ■ Signs and Symptoms

Direct trauma to the groin can compress the testicles against the pelvis, leading to a nauseating, painful condition. Immediate internal hemorrhage, effusion, and muscle spasms may occur. Occasionally, blunt trauma leads to swelling in the tunica vaginalis (**traumatic hydrocele**) ([Fig. 23.21A](#)). In 9% to 19% of men, the plexus of veins on the posterior testicle can become engorged, constituting a **varicocele**. These lesions may be described as “a bag of worms” adjacent to the testicle and cord ([Fig. 23.21B](#)). If the plexus ruptures in response to blunt trauma, blood rapidly accumulates in the scrotum, leading to a **hematocele**. In nearly 50% of patients with traumatic hematocele, testicular rupture also is present. Pain is not a good indicator of which structure is

damaged. Swelling and hemorrhage inside the scrotal sac can enlarge the sac to the size of a tennis ball or grapefruit. Each condition can lead to irreparable testicular damage if an evaluation and treatment by a physician is delayed.



**Figure 23.21. Testicular injury.**  
**A,** Hydrocele. **B,** Varicocele. **C,** Spermatic cord torsion around the tunica vaginalis.

An individual with torsion of a testicle may or may not have a history of trauma. Congenital variations in the testicular suspension can cause rotational twisting of the vascular pedicle and spermatic cord, producing varying degrees

of circulatory compromise ([Fig. 23.21C](#)). This condition typically is seen at or around puberty, manifesting itself after physical activity. Groin pain may develop gradually or rapidly, and it sometimes occurs with associated nausea and vomiting. Immediate referral to a physician is necessary if correction of the condition is to be successful. A high-resolution ultrasound is used to determine if the blood supply is absent in the testicle as well as the extent and severity of the injury. Recovery is nearly 100% if corrected within 6 to 8 hours.

A scrotal mass also can be indicative of testicular cancer, which is the most common malignancy in males from 16 to 35 years of age. Males with an undescended or partially descended testicle are at higher risk than others for developing testicular cancer. The first sign of a mass is a slightly enlarged testicle that has a change in its consistency. The mass is separate from the cord and epididymis. In many cases, a dull ache or a sensation of dragging and heaviness is present in the lower abdomen or groin. The diagnosis is established using ultrasound or transillumination with a bright light. Early detection and surgical treatment yields an excellent survival rate.

## ■ Management

A testicular spasm can be relieved by placing the individual on his back and flexing his knees toward the chest ([Fig. 23.22](#)). Another method to reduce testicular spasm involves lifting the individual a few inches off the ground and then dropping him to the ground. As the pain subsides, a cold compress should be placed on the scrotum to reduce swelling and hemorrhage. Treatment for swelling inside the scrotal sac involves aspiration of fluid and an injection of a solution to toughen the involved tissues. Symptoms disappear in 85% to 90% of the cases with this treatment. Suspected testicular cancer should be immediately referred to a physician as the condition is highly treatable when diagnosed early.



**Figure 23.22. Relieving a testicular spasm.** The patient should lie on his back and flex the knees toward the chest until pain is relieved.

## Female Genital Injuries

### *Etiology*

Injuries to the vulva usually are caused by trauma associated with a fall, straddling, or penetration resulting in forced perineal stretching because of sudden leg abduction. These injuries have occurred in a variety of activities, including gymnastics, water skiing, snowmobiling, motorcycling, bicycling, sledding, cross-country skiing, and horseback riding.

### *Signs and Symptoms*

A hematoma can result from a direct impact to the genital region. If the trauma is great enough, the pubic symphysis may also be injured, leading to osteitis pubis.

### *Management*

Nearly all injuries are easily treated by the application of ice, mild compression, and bed rest. Occasionally, high-speed water skiing injuries result in water being forced under high pressure into the vulva and vagina, leading to a rupture of the vaginal walls. The water also can be forced through the uterus and fallopian tubes, leading to localized pelvic peritonitis. These injuries are easily preventable by wearing a neoprene wetsuit or nylon-reinforced suit.

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Direct trauma to the groin can lead to a laceration, scrotal contusion, hematoma, torsion, dislocation, or rupture of the testicles. If persistent pain or swelling of the testicles occurs, the patient should seek immediate medical attention.

## SUMMARY

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1. Severe blunt trauma to the anterior neck region, thorax, and viscera can have devastating effects that lead to serious ventilatory and circulatory compromise.
2. Blows to the throat may result in severe pain, laryngospasm, and acute respiratory distress.
3. A stitch in the side is a sharp pain or spasm in the chest wall, usually on the lower right side. Several strategies can be used to enable the affected individual to run through the pain.
4. Severe blunt trauma to the breast should be documented on a woman's permanent medical record to avoid misreading a mammogram.
5. A strain of the pectoralis major muscle involves an actively contracting muscle that is overburdened by a load or extrinsic force that exceeds tissue tolerance. If muscle fibers have been ruptured, resisted horizontal adduction and internal rotation of the shoulder are weak and accentuate the deformity.
6. Signs and symptoms indicating a possible internal thoracic condition include the following:
  - Shortness of breath or difficulty breathing
  - Severe chest pain aggravated by deep inspiration
  - Abnormal chest movement
  - Abnormal or absent breath sounds

7. A hernia is a protrusion of abdominal viscera through a weakened portion of the abdominal wall and can be either congenital or acquired. An indirect inguinal hernia is the most common hernia in young athletes.
8. Signs and symptoms indicating a possible intra-abdominal condition include the following:
  - Severe abdominal pain
  - Nausea or vomiting
  - Distended abdomen
  - Tenderness, rigidity, or muscle spasm
  - Rebound pain
  - Absence of bowel sounds
  - Blood in the urine or stool
9. Certain injuries may not develop until hours, days, or even weeks later. As such, the presumption of possible intrathoracic or intra-abdominal injuries with any blunt trauma necessitates a complete assessment.
10. Assessment of injury to the thorax and visceral region should focus on the vital signs and history of the injury.
11. Observation, palpation, and sites of referred pain can confirm suspicions of an existing internal injury.
12. If at any time, signs and symptoms indicate an intrathoracic or intra-abdominal injury, the emergency medical plan, including summoning EMS, should be activated. The vital signs should be monitored every 5 to 7 minutes to determine if the individual's condition is improving or deteriorating.
13. If on-site recovery occurs, the individual should still be provided with information identifying the signs and symptoms that could develop later and indicate that the condition is getting worse. The individual also should be provided with instructions for seeking medical assistance.

## APPLICATION QUESTIONS

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1. During a collision, an ice hockey player is struck in the anterior neck by the blade of another player's skate. Blood is spurting from the region. What is the first thing that you should do? How would you manage this condition?
2. During a collision in a bike race, a rider fell forward onto the handlebars and is now complaining of sharp pain on the lower right side of the rib cage, aggravated by deep breathing, coughing, and palpation over the injured site. During the assessment, you notice that he is coughing up bright red blood. What injuries might be present? How would you manage this condition?
3. A 20-year-old football player was struck in the abdomen with a helmet and experienced a sudden onset of abdominal pain in the upper left quadrant. What questions should be asked to develop a history of this injury? What structures would you palpate first? Last? What specific factors should be noted during the palpations?
4. You are a high school athletic trainer. During preseason volleyball practice, a 16-year-old female begins to hyperventilate during sprinting drills. How would you manage this condition? If the initial management does not result in a return to normal breathing within several minutes, what actions would you then take?
5. A 22-year-old male was performing a bench press with the weight at 80% of his one repetition max. During the third repetition of the second set, he felt a snapping sensation over his right upper chest wall. He is also complaining of an aching, fatigue-like pain in his arm and chest. In looking at the chest wall, what factors might you be looking for to suggest a potential injury? What muscle tests could be done to determine a possible pectoralis major muscle strain?
6. In attempting an overhead hit in volleyball, an athlete experiences a sharp pain in the midabdominal region. There is no visible swelling or



discoloration and no radiating pain. In palpating this injury, what are you feeling for? Are there any special tests to determine if this injury is an abdominal strain?

7. A 21-year-old female gymnast finished practice an hour ago but is now complaining of vague chest discomfort and shortness of breath. She is also experiencing pain on the top of the right shoulder. Her pulse is somewhat elevated but you are not sure if that is due to anxiety or an injury. Following the history component of the assessment, you suspect a pulmonary complication because of pain on deep inspiration. However, you are not sure if it is superficial or internal. What factors can you observe that might provide information to help determine if there is an injury to the chest wall or an internal complication?

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