Chapter 8

Internal Injuries, the Spine and Back

The beginning of this chapter will deal with some of the most dangerous athletic injuries: internal injuries to the abdomen and thorax. Fortunately, this type of injury is rare. We think, though, that a student trainer must be aware of the causes and signs of internal injuries. Someday, your awareness could help save a life.

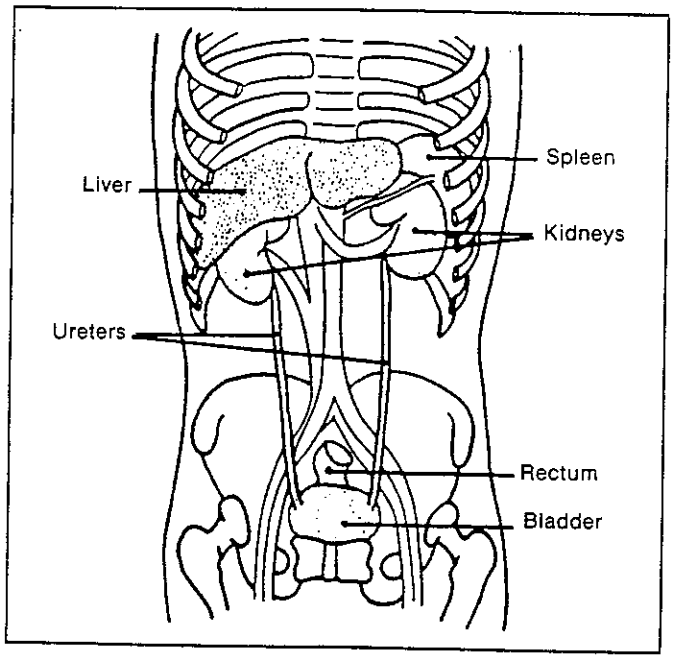
The second part of the chapter will cover another serious injury, spinal injuries. A discussion of back strains concludes the chapter.

Abdominal Injuries

The abdomen is susceptible to injuries in contact sports. Housing many internal organs, the abdominal cavity is the area below the ribs and diaphragm and above the pelvis. Among the organs in the abdominal cavity are the kidneys, spleen and bladder.

Many of the abdominal injuries seen in sports will be simple muscle contusions. When strong, the abdominal muscles can help protect the internal organs in the abdominal cavity. The back also has a thick wall of muscles that offers protective padding.

With any suspected abdominal injury, the athlete should be taken immediately to a medical facility. The injured athlete should not be permitted to have any food or drink.



The abdominal organs (Source: **Modern Principles of Athletic Training**, *5th Edition, Arnheim, 1985.)*

Kidneys

The kidneys are a set of paired internal organs in the lower-mid back, one on each side of the spine. Kidneys are approximately 4½" long, 2" wide and 1" thick. The function of these organs is to filter waste products from the blood.

In athletics, when a kidney is injured, the injury is usually a contusion caused from a direct blow to the back. Offering protection to the kidneys from the front are other internal organs.

Kidney damage may be revealed by any of these signs:

1) Shock
2) Pain in the back
3) Rigid muscles, either on the back or abdomen
4) Nausea or vomiting
5) Blood in the urine

Note: Blood in the urine may not be obvious; the urine may appear slightly pink, or even cloudy. Sometimes the blood is visible only through a microscope. Also, sometimes uninjured athletes have blood in the urine.

A kidney contusion will often heal itself. However, if the student trainer suspects kidney damage, the athlete must immediately be transported to a medical facility. Because of the danger, a person with only one kidney should choose not to participate in contact sports.

Spleen

Along with the bladder and kidneys, the spleen is one of the internal organs most often injured in athletics.

The largest lymphatic organ of the body (5" in length), the spleen also stores red blood cells. It is located in the upper left section of the abdominal cavity, just below the diaphragm.

The spleen can suffer a contusion from either a blow to the front or the back of the body.

Signs a student trainer can look for that would indicate damage to the spleen include:

1) Paleness
2) Cool, clammy skin
3) Rapid, but weak, irregular pulse
4) Rigidity in the abdomen
5) Nausea and vomiting

Another indicator of spleen rupture is called Kehr's sign. This sign consists of pain in the left shoulder and several inches down the left arm. This pain away from the site of injury is called *referred pain.*

There are two more important factors about spleen injury that the student trainer must know. One is the

spleen's connection to the disease mononucleosis. The other concerns the spleen's ability to splint itself.

In a case of infectious mononucleosis, the spleen is enlarged as it manufactures more red blood cells, making it more susceptible to damage. In this enlarged state, the organ is so delicate that it could be ruptured by an action as minor as the athlete turning over in bed. For this reason, an athlete who is suspected of, or is recovering from mononucleosis, should not participate in sports.

In some cases, the spleen will be injured and start hemorrhaging internally, only to splint itself, stopping the bleeding. At some time in the future, however, days or even weeks after the injury, another blow (even a slight one) could start the hemorrhage again. Although a person can live without a spleen, if an injury goes unnoticed death can result.

Bladder

The other internal organ most often injured in athletics is the bladder. Unlike the kidneys and spleen, the bladder is a hollow, not solid, organ. Hollow organs are less likely to be injured.

Located in the lower abdomen, the bladder collects urine before excretion. Naturally, it is better and safer for an athlete to participate when the bladder is empty, rather than distended.

Signs of a damaged bladder include:

1) Inability to urinate
2) Blood in the urine
3) Nausea and vomiting
4) Rigidity or pain in the abdomen
5) Shock

Solar Plexus Contusion

Unlike the previously mentioned injuries, the solar plexus contusion is not organ-related. The solar plexus is a network of nerves located behind the stomach. Some of these nerves help control the diaphragm, an important muscle in breathing.

You can see how a contusion of this area can interrupt breathing. A blow to the upper abdomen, right below the sternum, can affect the solar plexus, causing the diaphragm to spasm.

The resulting symptom of this injury is often called "having the wind knocked out," which may be a frightening experience for the athlete. Recognizing the probable injury, the coach or student should: Have the athlete lie down with legs elevated; try to calm the player by reassuring him or her that the experience will pass quickly; loosen belts and clothing for comfort; encourage the player to take short breaths in through the nose, and long breaths out through the mouth. Lifting the prone athlete by the belt is an unnecessary and potentially dangerous practice.

Even though a blow to the solar plexus can be frightening to the athlete, this is not a medical emergency unless the symptoms do not disappear rapidly. For those times when the athlete has severe breathing difficulties or a complete lack of breathing, every coach, trainer and student trainer should have training in cardiopulmonary resuscitation (CPR).

Although solar plexus contusions are usually minor injuries, the force of the blow may be severe enough to do internal damage. If internal damage is suspected, refer the athlete to a physician immediately.

"Stitch in the Side"

This painful injury occurs most often during running, and it may be the result of lack of oxygen to the respiratory muscles. Lack of oxygen is caused by shallow, rapid breathing, which denies the muscles sufficient oxygen for the exertion demanded of them. Those athletes who are out of condition are more likely to suffer a stitch in the side.

The best way to relieve this condition is to have the athlete stop running, expel the air in the lungs forcefully, and take slow, deep breaths. Stretching the arm overhead on the painful side can also help relieve the pain.

Vocabulary

abdomen *— area below the ribs and diaphragm and above the pelvis*

bladder *— hollow organ in the lower abdomen; collects urine for excretion*

diaphragm *— thin muscle separating the thoracic and abdominal cavities; plays an important role in breathing*

direct fracture *— fracture caused by a kick or blow to a body part*

indirect fracture *— fracture caused by general compression, as to the rib cage in wrestling*

kidneys *— set of paired organs in the lower back, one on each side of the spine; filter waste products from the blood*

referred pain *— pain that occurs away from the injury site*

solar plexus *— network of nerves located behind the diaphragm*

spine *— curved vertebral column extending from the neck to the pelvic region*

spleen *— largest lymphatic organ in the body; located just below the diaphragm in the upper left section of the abdomen; stores red blood cells*

strain *— stretching or tearing of muscle or tendon*

thorax *— the chest; area of the body above the diaphragm and below the neck*

vertebrae *— 33 irregularly shaped bones that extend from the neck to the pelvic region and make up the spine*

Thoracic Injuries

Commonly called the chest, the area above the diaphragm and below the neck is also known as the thorax.

The internal organs of the thorax are the heart and lungs. These organs are well protected both front and back.

On the front of the body, the rib cage, which includes 12 pairs of ribs and the sternum, offers protection. The thoracic vertebrae help protect the thorax from the back.

Rib Injuries

In contact sports, such as football and wrestling, rib fractures occasionally occur. The cause can either be a direct blow or compression of the rib cage. The fracture can cause internal bleeding and/or collapse of a lung. The athlete may also find breathing difficult.

A *direct fracture* of the ribs is caused by a kick or block to the area, while an *indirect fracture* is due to a general compression of the rib cage, as could occur in wrestling.

A direct fracture can cause the most serious damage because the blow usually fractures and displaces the ribs inward. The jagged edges of the fragments may tear, cut, or perforate the tissue surrounding the lung or cause the lung to collapse.

Unlike the pattern of a direct fracture, the indirect fracture causes the rib to spring and fracture outwardly.

A rib fracture is very easy to detect. The injury can be recognized by intense pain upon movement or respiration, and point tenderness. If the student trainer suspects a rib fracture, the physician should be notified.

A rib fracture is usually treated with support and rest. A simple, indirect fracture generally heals within three to four weeks.

Providing protection for an athlete who has sustained a rib fracture and is ready to return to action is somewhat difficult. Ribs are a problem to tape because it's impossible to get complete immobilization.

If fractured ribs are suspected, the athlete should be transported to the hospital.

Back Injuries

The most common back injuries are minor strains, sprains and contusions. These injuries are often caused by sudden or forceful twisting, a direct blow, improper mechanics, or a lack of flexibility.

Any injury to the back should be treated conservatively, especially until fractured vertebrae are ruled out. If an injury this serious is suspected, the athlete should not be moved except by an ambulance crew. Mishandling of a vertebral fracture can cause spinal cord damage, resulting in paralysis.

Back Strain

One of the most frustrating and nagging problems in athletics is the back strain. There are very few movements in sports that do not use the muscles of the back in some degree of extension, lateral flexion, rotation or in stretching, as in flexing the trunk. When the back muscles are strained, all of the movements that we have just mentioned will produce some degree of discomfort in the athlete. Even the maintenance of normal posture can be uncomfortable.

When we speak of a back strain, the muscles that we are primarily concerned with are collectively called the erector spinae, a very long muscle group on each side of the vertebral column.

Evaluation

An athlete who complains of a sore back and has a muscle strain to the erector spinae will have pain in one particular area along this muscle group. As the trainer palpates the back, the place that has the most point tenderness will be the site of the strain.

General soreness will surround the injured area, and the athlete will experience pain when extending the back. If the athlete bends forward, by flexing the trunk, pain may also be felt, because the erector spinae are being stretched in this position.

Treatment

When an athlete has a back strain, the initial treatment is to apply ice bags or cold packs to the area. The cold treatment will help to decrease the hemorrhaging that is taking place in the muscle tissue. Make sure that all sore areas are covered with cold for at least 20 minutes. Very few people want to put ice on their backs, but this is very important and should never be neglected. In addition to slowing down the internal bleeding, the ice will help to reduce muscle spasm. Also, cold is often a stronger stimulus than pain, so the athlete will not feel the pain as much. A pillow under the stomach will help take tension off the back.

Explain to the athlete that the ice will feel very uncomfortable at first, but that the cold will numb the area quickly and reduce the pain. Again, make sure to use ice as the mode of treatment until all signs of hemorrhaging have ceased.

Athletes also need instructions concerning follow-up treatment at home:

1) Continue to keep cold on the back for 20 minutes once every hour until going to sleep.

2) When in bed, sleep with the knees bent, such as in the fetal position if sleeping on the side, or with a pillow under the knees if sleeping on the back. If sleeping on the stomach, place a pillow under the stomach. Never sleep in a totally extended position, as this will place a lot of tension on the back muscles. Keeping the hips and knees flexed keeps the muscles in a stretched position, reducing this tension.

3) Wear shoes that have low heels. High-heeled shoes or boots cause the body to assume an abnormal posture

in order to maintain an erect position. A comfortable pair of tennis shoes can help relieve a back strain.

4) Avoid standing for long periods of time. Standing will cause tension throughout the back as weight is constantly shifted to get comfortable. Elevating one foot while standing can reduce this strain.

5) Sit and sleep on firm surfaces.

6) Sit with the knees higher than the hips.

Rehabilitation

In rehabilitating a back strain, the following exercises will help to restore flexibility and strength. These exercises should be done in the morning and then repeated later in the day. Hold each exercise for 10 seconds and repeat each one 10 times.

1) Pelvic tilt — lie on the back with the knees slightly bent. Flatten the arch in the low back area against the floor or table by tightening the buttocks and stomach muscles simultaneously.

2) Alternate knees to chest — lie on the back with the legs straight. Slide one heel to the buttocks, lift the knee toward the chest, using the arms and hands to help bring the knee gently to the chest. Pull slowly and steadily to feel a gentle stretch. Return the leg to the straight position and repeat with the other leg.

3) Bring both knees to the chest simultaneously in the same way as in exercise number two.

4) Curl up — lie on the back with the knees bent. Walk the hands up the thighs slowly by bringing the vertebrae off the floor or table one at a time until the wrists are on top of the knees. Return to the starting position by reversing the procedure.

5) Head and neck extension — lie on the stomach with the hands behind the head. Raise the head, shoulders and elbows off the surface slowly. Return to the starting position.

6) Alternate arm and leg extension — lie on the stomach with the arms extended over the head. Raise the right arm and left leg simultaneously. Return to the starting position and repeat with the left arm and right leg.

Continue these exercises until they can be performed in their entirety. If there is any pain during the exercises, they should be stopped. Always begin with exercise number one and progress in order. The exercises should be performed at least three times each day (on a hard surface — not on a bed) after all signs of hemorrhaging have ceased or when the physician recommends that rehabilitation may begin.

Continue the exercises even when all signs of the back strain have disappeared. They can be done easily as part of a warmup before practice, and because they should be done on a hard surface, you will never be without an area to work.

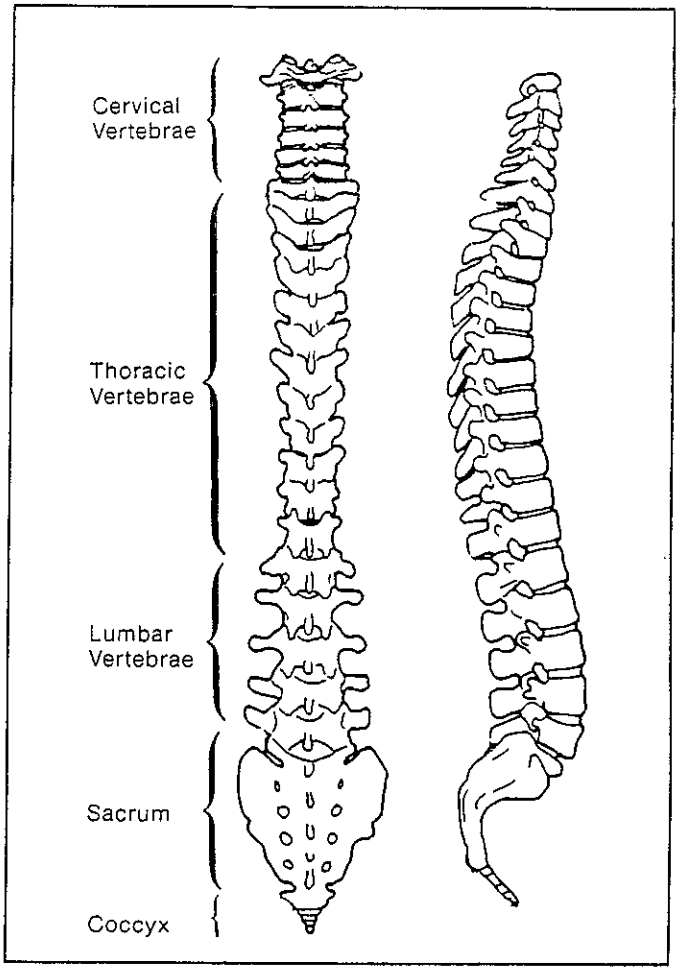
The Spine

The spine is the curved vertebral column made up of 33 irregularly shaped bones called vertebrae. They extend from the neck to the pelvic region. Generally, the lower on the vertebral column, the larger the vertebrae.

The seven vertebrae in the neck region are called *cervical vertebrae*. In the chest region, there are twelve *thoracic vertebrae*. The low back has five *lumbar vertebrae*. In the pelvic region, the vertebrae are fused, or immovable. The triangular *sacrum* has five fused vertebrae while the *coccyx* has four.

The movable vertebrae allow rotation, forward and lateral movement; little backward movement is possible. Each vertebra has ligament and muscle attachments.

The vertebral column encases and protects the spinal cord, which transmits the nervous system's commands for both voluntary and involuntary muscular movement. Because the vertebrae protect the spinal cord, any injury



The vertebrae can be fractured or dislocated, just like any other bone. Because the vertebral column encases the spinal cord, any injury to the vertebrae can result in permanent paralysis or death.

to these vertebrae can have serious implications; damage to the spinal cord can result in permanent paralysis or even death. (For further discussion of neck injuries, see Chapter 11.)

Just like any other bone, the vertebrae can be fractured or dislocated; the ligaments connecting each vertebra to the ones above and below it can be strained. Although cervical fractures and dislocations are notorious for occurring in football, these serious injuries can happen in any sport.

If any of the following actions are observed or described by the athlete or witnesses, a spinal injury should be suspected: Forced flexion or extension of the head, a snapping action, a head-on or direct blow, or forced rotation of the head.

Symptoms of spinal injuries include any of the following: Pain in the neck or back; inability to move the neck; paralysis below the site of the fracture; decreased limb strength; numbness, tingling or a burning sensation in the limbs; deformity in the cervical area; a history of spinal injury; muscle spasm or swelling.

If a spinal injury is suspected, only trained emergency medical personnel should handle the athlete. No one should move the injured athlete, as movement could cause a complete dislocation and make the injury worse.

Review Questions — Part Two

1. What type of injury is most common to the abdomen?
2. How is the kidney usually injured in sports?
3. What are some signs of kidney damage?
4. What are some signs of a damaged spleen?
5. What is Kehr's sign?
6. What are some of the signs of an injury to the bladder?
7. Why shouldn't an athlete with mononucleosis participate in contact sports?
8. What can happen in the future if the spleen splints itself following an injury?
9. What is the solar plexus, and where is it located?
10. What causes an athlete to have his "wind knocked out"? What can a coach or trainer do to help the athlete through this experience?
11. How should a back strain be evaluated?
12. Describe some rehabilitation exercises for back strain. What can an athlete do at home to treat a back strain?
13. Describe the cause of a "stitch in the side." What is the proper treatment?
14. What are two signs of a rib fracture?
15. What are some of the symptoms of spinal injury?
16. What actions are often associated with spinal injuries?
17. Why should only trained medical personnel handle an athlete with a suspected spinal injury?

Chapter 8 — Basic Athletic Training

Review Questions — Part One

1. The abdomen, which houses many internal organs, is the area below the _____ and _____ and above the _____ .

2. Many of the abdominal injuries seen in sports will be simple _____ .

3. Kidneys are often contused from a direct blow to the _____ .

4. The largest lymphatic organ of the body is the _____ . _____ sign, which consists of pain in the left shoulder and arm, is an indication of rupture of the _____ .

5. Pain away from the site of injury is called _____ pain.

6. Two possible complications of rib fractures are _____ _____ and _____ of a lung.

7. Two names for the area above the diaphragm and below the neck are the _____ or _____ .

8. The bladder, unlike the spleen and the kidneys, is a _____ organ.

9. The solar plexus is a network of _____ located behind the _____ .

10. An inappropriate and even dangerous method of attempting to treat a solar plexus contusion is to _____ the athlete by the _____ .

11. A "stitch in the side" may be the result of lack of _____ to the respiratory muscles. The cause may be shallow _____ .

12. A good method to evaluate a muscle strain of the back is by _____ .

13. The structures that connect one vertebra to another are called _____ .