

Diagnosing Bone and Joint Injuries

Reading Preview

Key Concepts

- What are some injuries of the skeletal system, and how can they be identified?
- How can bone and joint injuries be treated?

Key Terms

- fracture • dislocation
- sprain • X-ray
- magnetic resonance imaging
- arthritis • arthroscope

Target Reading Skill

Comparing and Contrasting

When you compare and contrast things, you explain how they are alike and different. As you read, compare and contrast X-rays and MRIs by completing a table like the one below. The information in your table will show how X-rays and MRIs are similar and different.

Procedure	X-Rays	MRI
Effect on body cells		
Types of injuries identified		

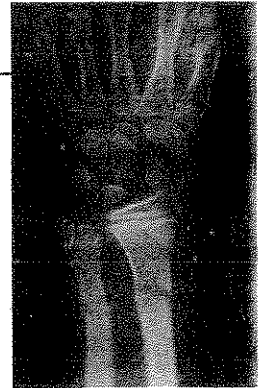
Lab zone Discover Activity

What Do X-ray Images Show?

1. Examine the photo of an X-ray image.
2. Try to identify what part of the human body the X-ray shows.
3. Look at the X-ray to find the break in a bone.

Think It Over

Observing What types of structures are seen clearly in the X-ray? What types of structures cannot be seen?



You're walking home from school on a winter day. It's cold outside, and snow and ice are on the ground. When you look ahead, you see some friends. Then, you call out, "Wait for me," as you run across an icy sidewalk to catch up to the group. Suddenly, you slip. As you lose your balance, you put out your arms to break your fall. The next thing you know, you're on the ground. Your hands sting, and you notice they are scraped. One wrist is starting to swell, and it hurts! If you try to move your wrist, it hurts even more. You need to get to a doctor—and fast.

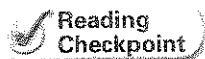
Common Skeletal System Injuries

On the way to the doctor, you might be wondering, "Is my wrist broken?" Your swollen wrist could be broken, or it could be injured in some other way. **Three common skeletal system injuries are fractures, dislocations, and sprains.**

Fracture A **fracture**, or a break in a bone, can occur when you fall in such a way that all of your weight is placed on only a few bones. There are two kinds of fractures—simple and compound. In a simple fracture, the bone may be cracked or completely broken into two or more pieces. In a compound fracture, the broken ends of the bone stick out through the skin.

Dislocation A second injury of the skeletal system is a **dislocation**. A **dislocation** occurs when a bone comes out of its joint. Sometimes a doctor can put back a dislocated bone without surgery. Other times surgery is needed.

Sprain A **sprain** occurs when ligaments are stretched too far and tear in places. If you have ever stumbled and turned an ankle, you may have felt a sharp pain. The pain probably occurred because the ligaments on the outside of your ankle stretched too far and partially tore. Sprains, especially of the ankle, are the most common joint injuries. Both sprains and fractures can cause swelling around the injured area.



What is the difference between a simple fracture and a compound fracture?

Identifying Injuries

When you see the doctor, she looks at your wrist and decides she needs to look inside your wrist to determine what's wrong. **Two ways to see inside the body and identify injuries of the skeletal system are X-rays and magnetic resonance imaging.**

X-rays X-ray images can determine whether bones have been broken. X-rays are a form of energy that travels in waves, like the light that your eyes can see.

Before an X-ray image is taken, a lead apron is placed on your body to protect you from unnecessary exposure to X-rays. Photographic film is placed under the area to be viewed. Then, a machine that emits a beam of X-rays is aimed at the area. The X-rays pass through soft tissue but not through bone. The X-rays absorbed by the bone do not reach the film. After the film is developed, it shows bones as clearly defined white areas.

One limitation of X-rays is that they cannot be used directly to view injuries to soft tissues, such as muscle and internal organs. In addition, the energy in X-rays can damage your body cells. This low, but rare, risk is why you should not have unnecessary X-ray images taken.

FIGURE 12

X-ray Diagnosis

X-rays can be used to show a dislocation of a joint.



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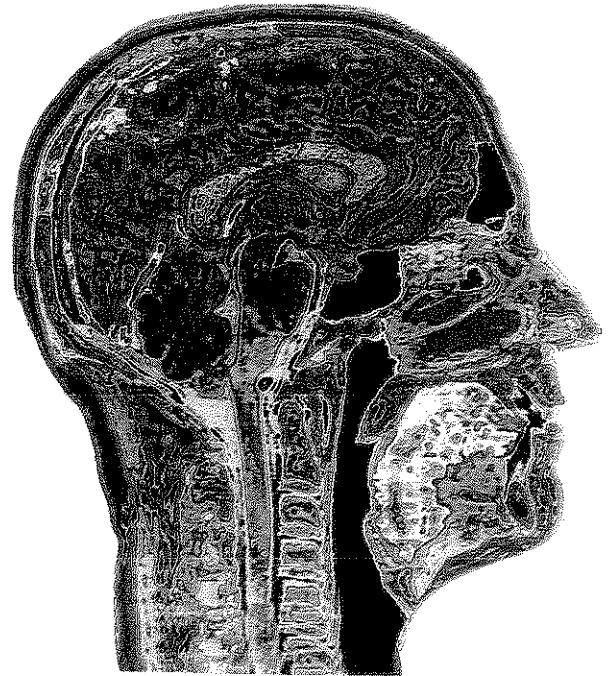


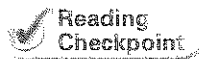
FIGURE 13

Magnetic Resonance Imaging

Magnetic resonance imaging can produce images of muscles and other soft tissues in the body, such as the image on the right.

Magnetic Resonance Imaging A method for taking clear images of both the bones and soft tissues of the body is called **magnetic resonance imaging**, or MRI. An MRI scanner is a large cylinder that contains electromagnets. The person is placed on a platform that slides into the center space of the magnet. The person is then exposed to short bursts of magnetic energy. This magnetic energy causes atoms within the body to vibrate, or resonate. A computer then analyzes the vibration patterns and produces an image of the area.

MRI images are amazingly sharp and clear. MRI can produce images of body tissues at any angle. In addition, MRI can show a clear image of muscles and other soft tissues that an X-ray image cannot show. Another advantage of MRI is that it does not damage cells. Because MRI machines are very expensive to buy and use, this technique is not used commonly to examine possible broken bones.



Reading
Checkpoint

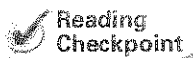
What is one advantage that X-rays have over MRI?

Treating Injuries

The doctor determines that your wrist is broken and puts a cast on it. You must wear the cast for six weeks until the bone heals. **In addition to wearing a cast, two other ways to treat skeletal system injuries include surgeries such as joint replacement and arthroscopy.**

Joint Replacement Not all injuries to the skeleton involve broken bones. Sometimes, the joints are injured or diseased and require treatment. This is often true for people who have arthritis. **Arthritis** is a disease of the joints that makes movement painful. When movement becomes extremely painful or impossible, the joint may be replaced with an artificial one made of metals or plastics. Doctors can replace knees, hips, shoulders, fingers, and wrists. During surgery, the natural joint is removed and an artificial one cemented into place.

Arthroscopy Joint injuries can also be treated by arthroscopic surgery. Doctors make a small incision and insert a slim, tube-shaped instrument called an **arthroscope** (AHR thruh skohp) into the joint. Attached to the arthroscope is a camera that projects the image from inside the joint onto a monitor. This allows doctors to look inside the joint to see what is wrong. After the problem is diagnosed, tiny instruments are inserted through a second small incision to make the necessary repairs. The arthroscope has helped to diagnose and repair many joint problems.



Reading
Checkpoint

What is arthritis?

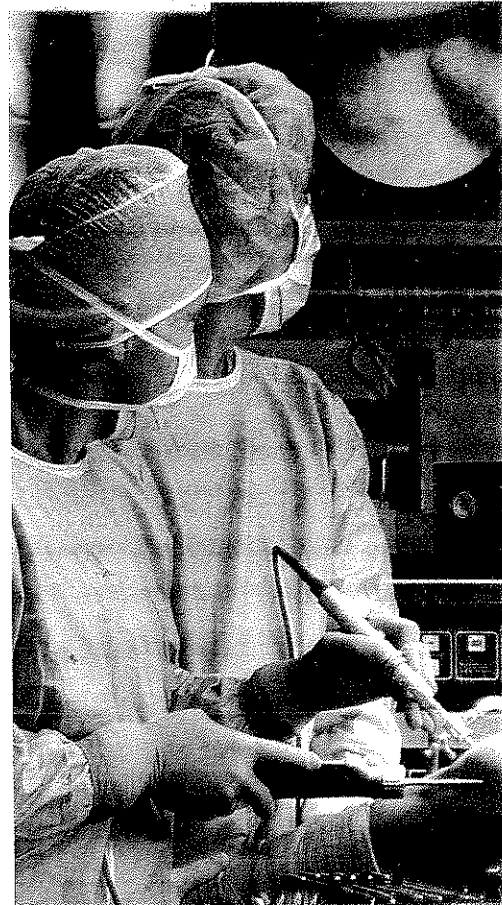


FIGURE 14

Arthroscopic Surgery

To diagnose and treat a knee injury, this surgeon has inserted an arthroscope into the patient's knee.

Section 3 Assessment

Target Reading Skill Comparing and Contrasting Use the information in your table about X-rays and MRI to help you answer Question 1 below.

Reviewing Key Concepts

1. a. **Listing** What are three common skeletal system injuries?
 - b. **Comparing and Contrasting** How might each of the different skeletal system injuries be diagnosed?
 - c. **Applying Concepts** Suppose that an X-ray of your injured wrist did not show a fracture. But, after a month, your wrist is still painful and stiff. Why might your doctor order an MRI?
2. a. **Identifying** What are two ways to treat bone and joint injuries surgically?
 - b. **Summarizing** Which joints can be replaced surgically and how is it done?
 - c. **Making Judgments** How has arthroscopic surgery improved the methods for treating bone injuries?

Lab
zone

At-Home Activity

Safety First List the types of exercise you and your family members do. With your family, brainstorm a list of safety gear and precautions to use for each activity in order to prevent skeletal system injuries. (For example, for bicycling, you might list wearing a helmet, stretching before riding, and avoiding busy streets and nighttime riding.) How can you put these safety measures into practice?