

CLINICAL APPLICATION

Epiphyseal Fracture



The point of articulation between the epiphysis and diaphysis of a growing long bone is susceptible to injury if overstressed, especially in the young child or preadolescent athlete. In these individuals the epiphyseal plate can be separated from the diaphysis or epiphysis, causing an epiphyseal fracture. This x-ray study shows such a fracture in a young boy. Without successful treatment, an epiphyseal fracture may inhibit normal growth. Stunted bone growth in turn may cause the affected limb to be shorter than the normal limb.



Diaphysis
Epiphyseal fracture
Epiphysis
Joint between articulating bones

TABLE 5-1

Main Parts of the Skeleton*

AXIAL SKELETON†	APPENDICULAR SKELETON‡
Skull	Upper Extremities
Cranium	Shoulder (pectoral) girdle
Ear bones	Arm
Face	Wrists
Spine	Hands
Vertebrae	Lower Extremities
Thorax	Hip (pelvic) girdle
Ribs	Legs
Sternum	Ankles
Hyoid bone	Feet

*Total bones = 206.
†Total = 80 bones.
‡Total = 126 bones.

Axial Skeleton

SKULL

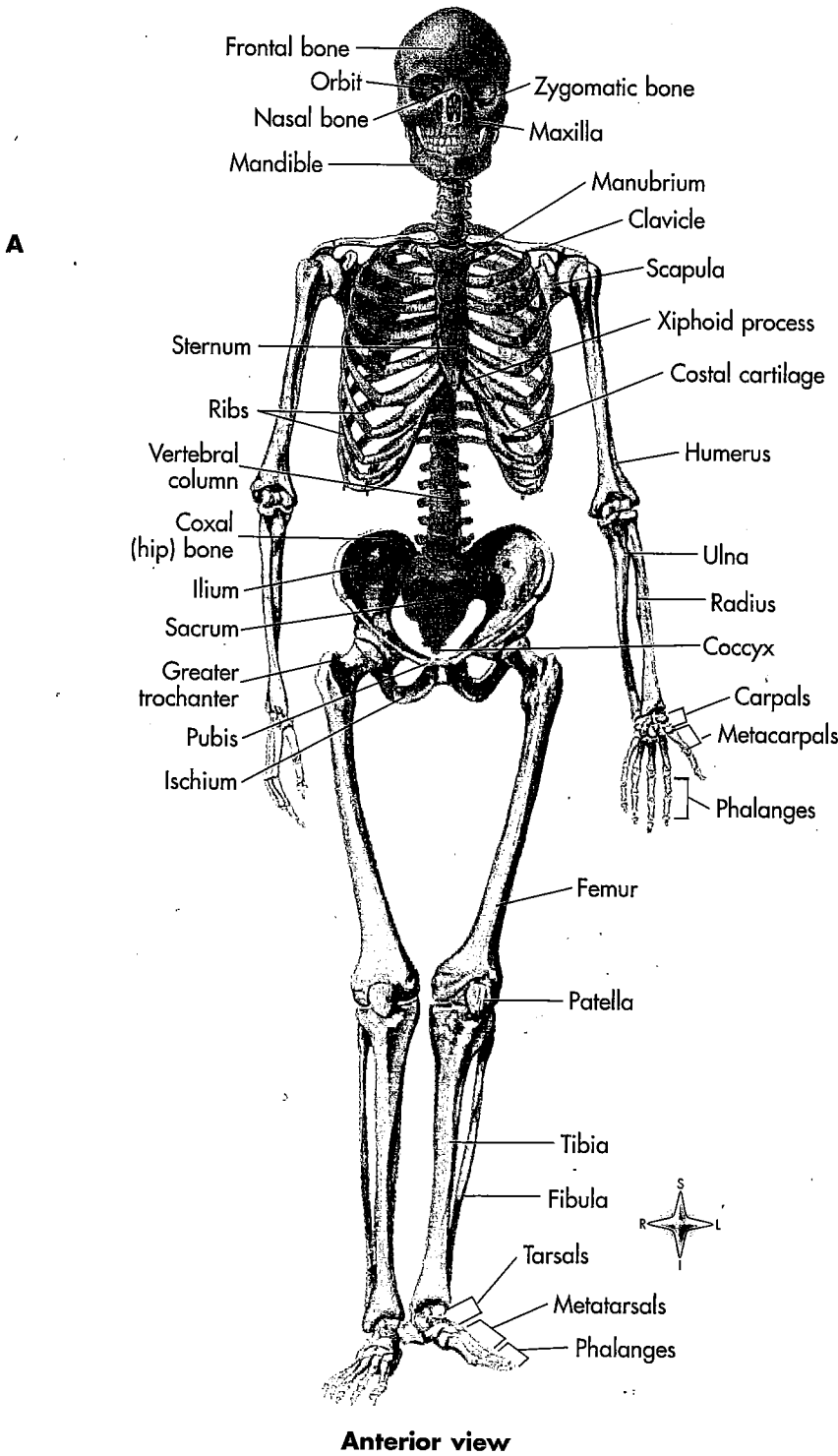
The skull consists of 8 bones that form the cranium, 14 bones that form the face, and 6 tiny bones in the middle ear. You will probably want to learn the names and locations of these bones; they are given in Table 5-2. Find as many of them as you can on Figure 5-8. Feel their outlines in your own body where possible. Examine them on a skeleton if you have access to one.

"My sinuses give me so much trouble." Have you ever heard this complaint or perhaps uttered it yourself? Sinuses are spaces or cavities inside some of the cranial bones. Four pairs of them (those in the frontal, maxillary, sphenoid; and ethmoid bones) have openings into the nose and thus are referred to as paranasal sinuses. Sinuses give trouble when the mucous membrane that lines them becomes inflamed, swollen, and painful. For example, inflammation in the frontal sinus (*frontal sinusitis*) often starts from a common cold. The suffix *-itis* added to a word means "in-

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FIGURE 5-7

Human skeleton. The axial skeleton is distinguished by its bluer tint. A, Anterior view.

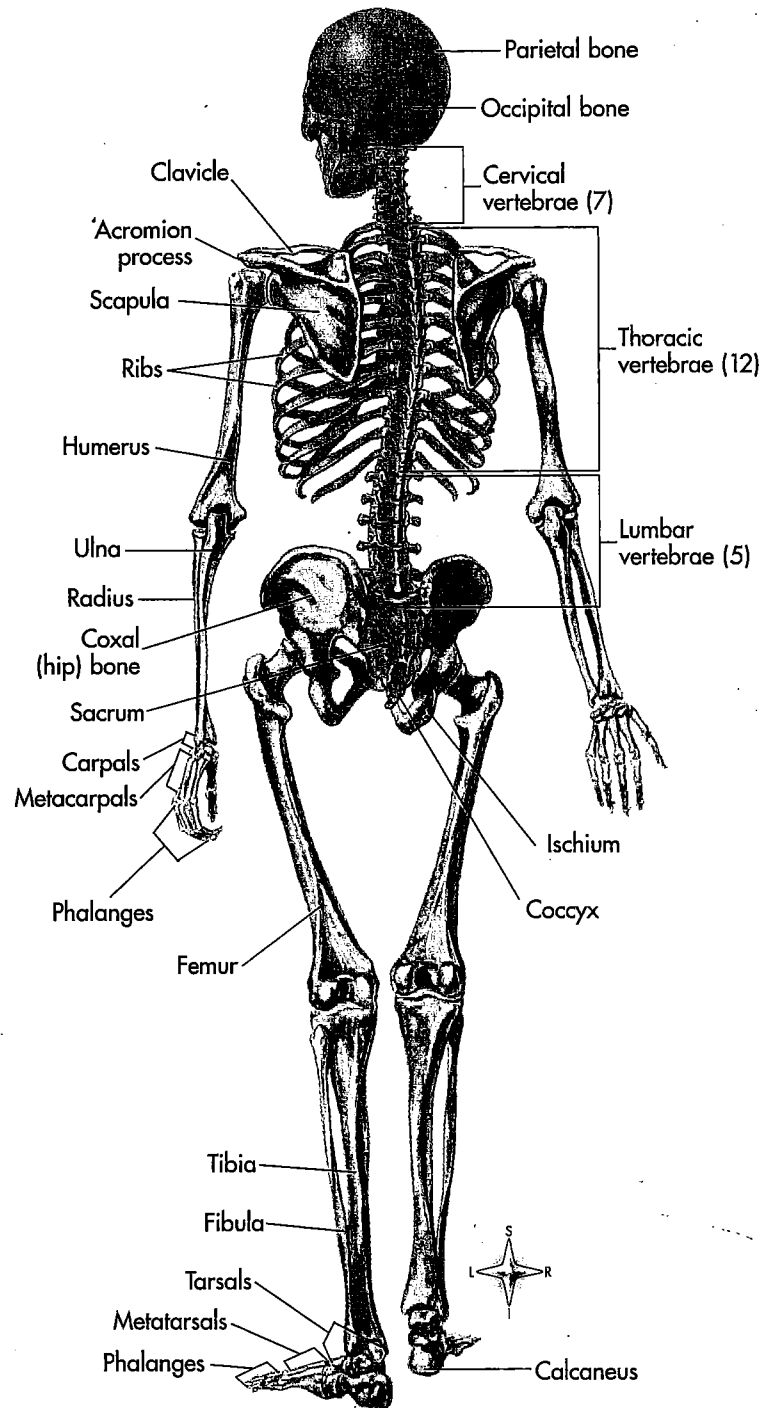


Anterior view

Continued

FIGURE 5-7—CONT'D

B, Posterior view.

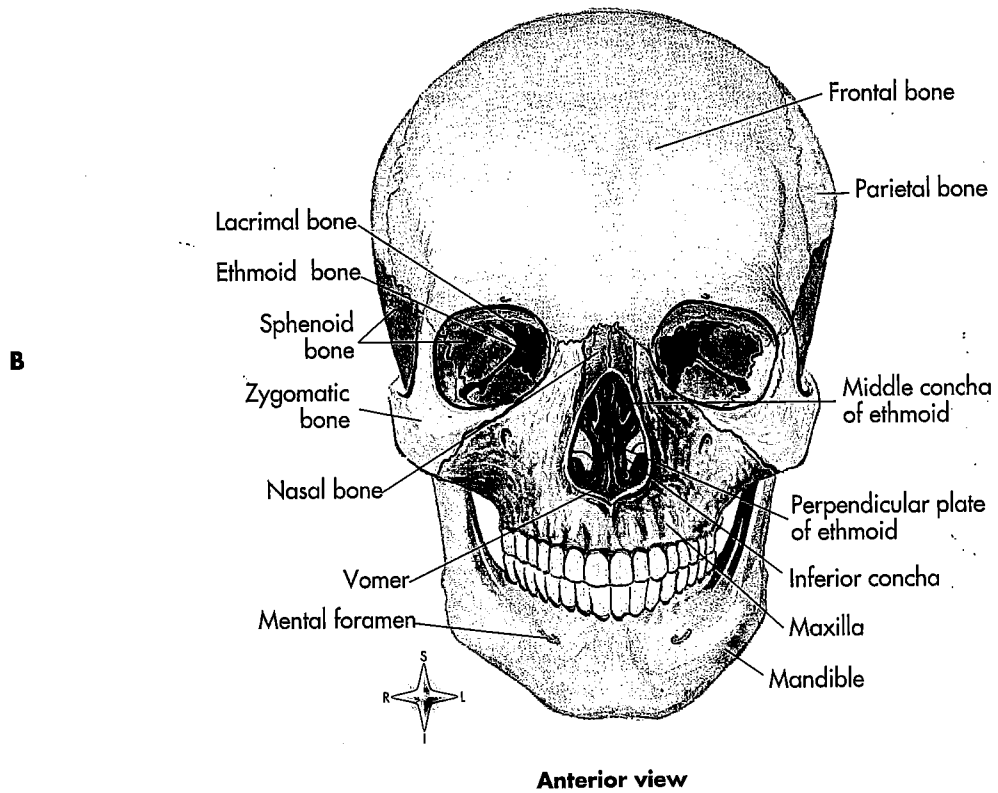
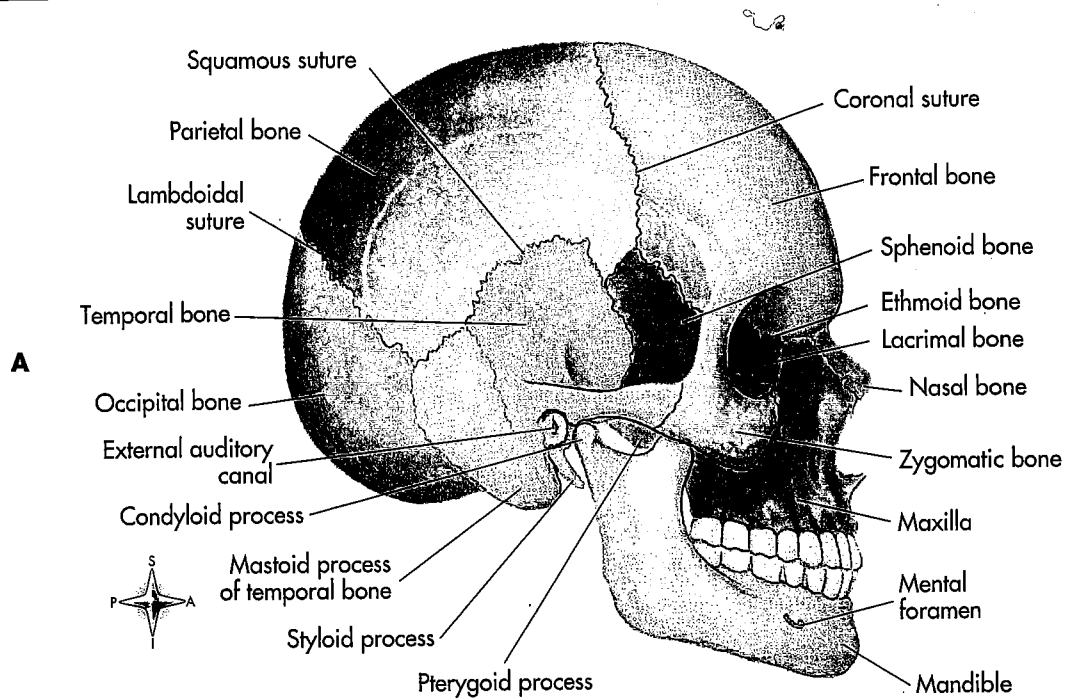


B

Posterior view

FIGURE 5-8

The skull. A, Right side. B, Front.



flammation of." Turn to p. 336 in Chapter 13 for a figure showing the size and location of the paranasal sinuses.

Note in Figure 5-8 that the two parietal bones, which give shape to the bulging topside of the skull, form immovable joints called **sutures** with several bones: the *lambdoidal suture* with the occipital bone, the *squamous suture* with the temporal bone and part of the sphenoid, and the *coronal suture* with the frontal bone.

You may be familiar with the "soft spots" on a baby's skull. These are six **fontanels**, or areas where ossification is incomplete at birth. You can see them in Figure 5-6. Fontanels allow some com-

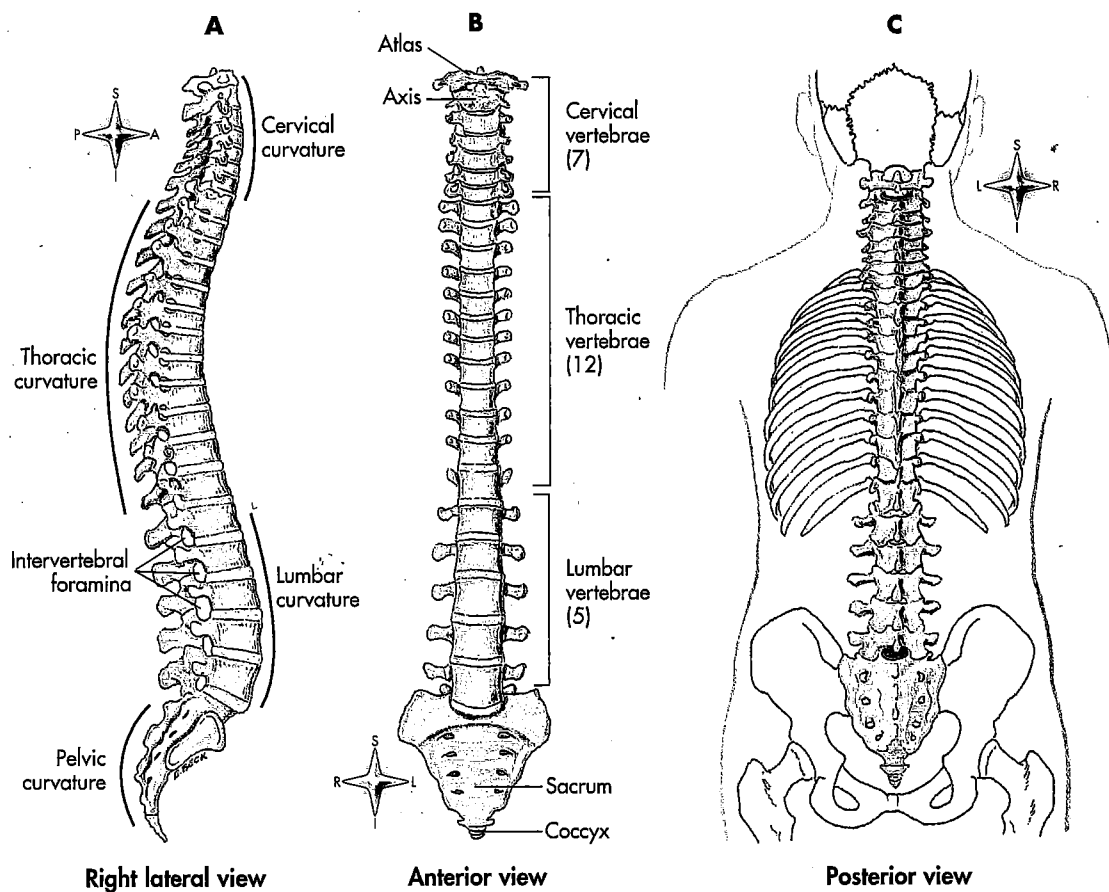
pression of the skull during birth without much risk of breaking the skull bones. They may also be important in determining the position of the baby's head before delivery. The fontanels fuse to form sutures before a baby is 2 years old.

SPINE (VERTEBRAL COLUMN)

The term *vertebral column* may conjure up a mental picture of the spine as a single long bone shaped like a column in a building, but this is far from true. The vertebral column consists of a series of separate bones or **vertebrae** connected in such a way that they form a flexible curved rod (Figure 5-9). Different sections of the spine have different

FIGURE 5-9

The spinal column. View shows the 7 cervical vertebrae, the 12 thoracic vertebrae, the 5 lumbar vertebrae, the sacrum, and the coccyx. **A**, Lateral view. **B**, Anterior view. **C**, Posterior view.



names: cervical region, thoracic region, lumbar region, sacrum, and coccyx. They are illustrated in Figure 5-9 and described in Table 5-3.

Although individual vertebrae are small bones that are irregular in shape, they have several well-defined parts. Note, for example, in Figure 5-10, the body of the lumbar vertebra shown there, its spinous process (or spine), its two transverse processes, and the hole in its center, called the *vertebral foramen*. The superior and inferior articular processes permit limited and controlled move-

ment between adjacent vertebrae. To feel the tip of the spinous process of one of your vertebrae, simply bend your head forward and run your fingers down the back of your neck until you feel a projection of bone at shoulder level. This is the tip of the seventh cervical vertebra's long spinous process. The seven cervical vertebrae form the supporting framework of the neck.

Have you ever noticed the four curves in your spine? Your neck and the small of your back curve slightly inward or forward, whereas the chest

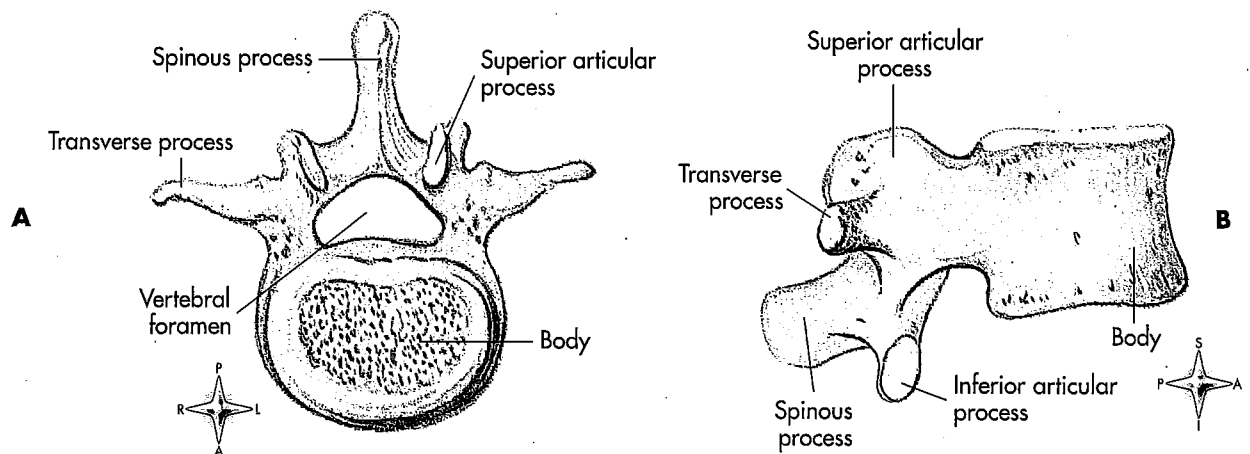
TABLE 5-3

Bones of the Vertebral Column

NAME	NUMBER	DESCRIPTION
Cervical	7	Upper seven vertebrae, in neck region; first cervical vertebra called <i>atlas</i> ; second, <i>axis</i>
Thoracic vertebrae	12	Next twelve vertebrae; ribs attach to these
Lumbar vertebrae	5	Next five vertebrae; are in small of back
Sacrum	1	In child, five separate vertebrae; in adult, fused into one
Coccyx	1	In child, three to five separate vertebrae; in adult, fused into one

FIGURE 5-10

The third lumbar vertebra. **A**, From above. **B**, From the side.



region of the spine and the lowermost portion curve in the opposite direction (Figure 5-9). The cervical and lumbar curves of the spine are called *concave curves*, and the thoracic and sacral curves are called *convex curves*. This is not true, however, of a newborn baby's spine. It forms a continuous convex curve from top to bottom (Figure 5-11). Gradually, as the baby learns to hold up his or her head, a reverse or concave curve develops in the neck, (cervical region). Later, as the baby learns to stand, the lumbar region of his or her spine also becomes concave.

The normal curves of the spine have important functions. They give it enough strength to support the weight of the rest of the body. They also provide the balance necessary for us to stand and walk on two feet instead of having to crawl on all fours. A curved structure has more strength than a straight one of the same size and materials. (The next time you pass a bridge, look to see whether or not its supports form a curve.) Clearly the spine needs to be a strong structure. It supports the head

FIGURE 5-11

Spinal curvature of an infant. The spine of the newborn baby forms a continuous convex curve.



that is balanced on top of it, the ribs and internal organs that are suspended from it in front, and the hips and legs that are attached to it below.

THORAX

Twelve pairs of ribs, the sternum (breastbone), and the thoracic vertebrae form the bony cage known as the **thorax** or **chest**. Each of the 12 pairs of ribs is attached posteriorly to a vertebra. Also, all the ribs except the lower two pairs are attached to the sternum and so have anterior and posterior anchors. Look closely at Figure 5-12, and you can see that the first seven pairs of ribs (sometimes referred to as the *true ribs*) are attached to the sternum by costal cartilage. The eighth, ninth, and tenth pairs of ribs are attached to the cartilage of the seventh ribs and are sometimes called *false ribs*. The last two pairs of ribs, in contrast, are not attached to any costal cartilage but seem to float free in front, hence their descriptive name, *floating ribs* (Table 5-4).

Appendicular Skeleton

Of the 206 bones that form the skeleton as a whole, 126 are contained in the appendicular subdivision. Look again at Figure 5-7 to identify the appendicular components of the skeleton. Note that the bones in the shoulder or pectoral girdle connect the bones of the arm, forearm, wrist, and hands to the axial skeleton of the thorax, and the hip or pelvic girdle connects the bones of the thigh, leg, ankle, and foot to the axial skeleton of the pelvis.

UPPER EXTREMITY

The **scapula** (SKAP-yoo-lah) or shoulder blade and the **clavicle** (KLAV-ik-kul) or collar bone compose the *shoulder* or *pectoral girdle*. This connects the upper extremity to the axial skeleton. The only direct point of attachment between bones occurs at the **sternoclavicular** (ster-no-klah-VIK-yoo-lar) **joint** between the clavicle and the sternum or breastbone. As you can see in Figures 5-7 and 5-12, this joint is very small. Because the upper extremity is capable of a wide range of motion, great pressures can occur at or near the joint. As a result, fractures of the clavicle are very common.