

# Broken Bones X-rays



Why do we have bones? Bones support our bodies and, together with our muscular system, allow us to move. Some bones, like those of the chest and skull, protect our vital organs. Bones also function as factories for our bodies' circulatory system, manufacturing red and white blood cells and platelets.

There are four basic kinds of bones in the body: long (e.g. arms and legs), short (e.g. finger bones), flat (e.g. skull and ribs) and irregular (e.g. vertebrae). Bones are made of living cells embedded in a mineral matrix. They're covered on the outside by a membrane called the periosteum, which is full of nerves and blood vessels. Under the periosteum is a layer of hard bone called cortical (compact) bone. Inside the cortical layer of all but irregular bones is a layer of cancellous (spongy) bone that has a honey-comb like structure that's filled with red marrow. The long bones (arm and leg bones) of adults also have hollow middles filled with yellow marrow. Marrow contains stem cells which the body uses to make blood cells and many kinds of tissue. Bones break in different ways, and each kind of fracture has its own name:

**Transverse** – Fracture that occurs perpendicular to the bone

**Oblique** – A fracture that's neither perpendicular nor parallel to the bone

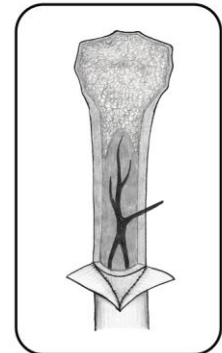
**Spiral** – A fracture in which a bone has been twisted apart

**Greenstick** – A fracture (usually in children) in which the bone does not break completely

**Comminuted** – A fracture in which bone is broken in a number of pieces. This kind of fracture results from high energy impacts like auto-accidents.

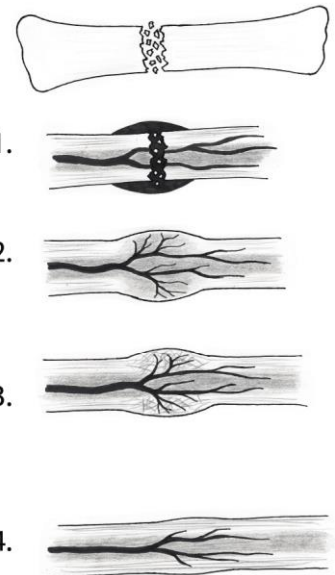
**Open** – A fracture in which bone breaks the skin

**Compression** – A fracture in which bone compresses and condenses rather than breaking apart. This type of fracture is most common in vertebrae.



The Healing Process:

1. When you fracture a bone, your body begins the healing process immediately. First a hematoma (blood clot) forms at the site of the fracture. Where does the blood come from? Your bones, just like every other part of your body, are filled with blood vessels that bring nutrients to bone cells and take away waste. When you break a bone, these blood vessels are also broken.
2. Within a few days new blood vessels begin to grow into the blood clot. The new blood vessels bring special repair cells to the injury site that begin to break down and absorb damaged bone and tissue. At the same time the blood clot is replaced by a matrix of collagen fibers. The collagen has a rubbery consistency and holds bone fragments in place while healing progresses.
3. Next your body begins to form a bone callus by mineralizing the collagen with calcium hydroxyapatite. As more minerals are added the collagen stiffens and becomes bone. This initial bone is described as "woven" since the fibers are not arranged in any particular order, but instead are layered and intertwined randomly.
4. In the last stage of bone healing the woven bone is remodeled and replaced by lamellar bone. Lamellar bone fibers are arranged parallel to one another, making lamellar bone much stronger than woven bone. After approximately three months the strength of the healing bone is at about 80% of normal and casts or braces are no longer necessary, but complete healing can take as long as 12 to 18 months.



FYI:

- X-rays are usually shot in two planes: anterior/posterior (front view) and lateral (side view).
- The joint above and below a fracture should always be x-rayed to check for dislocations or other related injuries that may not be immediately obvious.
- Any joint dislocation should be put back as soon as possible; fractures can be repaired up to 7-10 days after the injury occurs.
- Always wearing proper safety equipment greatly reduces the risk of fractures and other injuries.
- Spongy bone heals faster than compact bone.
- Children heal faster than adults because in children the periosteum is thicker than in adults and more healing cells can be brought to the bone.

More information on back.

## X-Rays included in this set:

### #1 Femoral shaft fracture (femur, thigh)

Comminuted fractures are caused by high-energy impacts. This one is the result of an accidental gunshot (pieces of lead can be seen in the x-ray), but motor vehicle accidents are more commonly to blame. Because comminuted fractures break the bone into many pieces they must be repaired surgically. FYI: The femur is one of the strongest bones in the body – a force of more than 16,000 psi is required to fracture it.

### #2 Radius fracture (wrist)

Oblique fractures like this one are usually caused by falls onto outstretched hands and are the most commonly seen fractures in pediatrics.

### #3 Supracondylar humerus fracture (elbow region)

This fracture was caused by a fall onto a fully extended arm that hyper-extended the elbow joint (bent the joint the wrong way). Because the fracture is so close to the joint it will have to be treated surgically with plates and screws.

### #4 Phalangeal fracture (finger)

Fractured fingers and toes are usually set and treated with splints, but surgery may be required if a break is severe or does not heal properly.

### #5 Monteggia fracture – ulna fracture with dislocation of the radial head

This less common injury is a fracture of the forearm with dislocation of the radial head (elbow). It is caused by a strike to the elbow with rotation and is usually treated by plating the fracture after relocating the radial head.

### #6 Patella fracture (kneecap)

This common injury can be caused by a fall or an impact, such as knees hitting the dashboard in a car accident. Patella fractures are usually treated with pins and a tension band that's wrapped tightly around the bone. FYI – The patella increases the power of the quad muscles by increasing leverage; losing your kneecap means losing 15-20% of the strength potential in your quad muscles.

### #7 Ulna and radius fractures (forearm)

Transverse fractures like this one are usually caused by a fall or direct strike to the arm – ex: hit with a baseball bat.

### #8 Hip dislocation

Hip dislocations are most commonly caused by high-energy impacts like auto accidents, but can also be caused by a fall from a significant height. This type of injury requires emergency surgery to restore blood flow to the ball of the hip; without immediate treatment the patient may face hip replacement surgery down the road.

### #9 Compression fracture of lumbar spine (lower back)

This very painful injury is caused by a hard fall to the buttocks – ex: a fall from a horse. The most common compressed vertebrae are just below the ribs at the 12th thoracic and the 1st lumbar; the difference in stress between the thoracic and lumbar makes this part of the spine the weakest link. This type of injury is usually treated non-operatively with a back support, but surgery may be required if there is neurological damage caused by pressure on the spinal cord.

### #10 Calcaneus fracture (heel bone)

Heel fractures can be particularly complicated injuries because the heel bone is flat and usually breaks into many pieces like an eggshell. Treatment of the injury is further complicated since the fracture can be difficult to visualize or locate in an x-ray; in many cases a CAT-scan is required to get a clear view of the fracture. This type of injury can be permanently debilitating, resulting in widening of the heel, rotation of the foot or chronic heel pain and a limp.

### #11 Tibia/fibula fractures (lower leg)

Transverse fractures like these are caused by direct strikes to the leg, often in auto accidents. Many of these fractures can be treated with casts, but some require surgical treatment with either rods or plates and screws.

### #12 Dislocated shoulder

This very common sports injury is treated by sedating the patient and manipulating the joint back into place. This injury, like any dislocation, must be treated immediately.

### #13 Clavicle fracture

A common sports injury, this fracture is also the most common injury to a child during birth. Treatment usually involves immobilizing the corresponding arm with a brace or sling.

### #14 Metatarsal fracture (foot)

This injury usually results from dropping something on the foot and is treated non-operatively with a walking boot.

### #15 Skull fracture

These result from a blow to the head. They can sometimes be associated with an underlying brain injury that may require immediate surgical treatment.

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