

Spinal Fractures basic level

Overview

Spinal fractures are different than a broken arm or leg. A fracture or dislocation of a vertebra can cause bone fragments to pinch and damage the spinal nerves or spinal cord. Most spinal fractures occur from car accidents, falls, gunshot, or sports. Injuries can range from relatively mild ligament and muscle strains, to fractures and dislocations of the bony vertebrae, to debilitating spinal cord damage. Depending on how severe your injury is, you may experience pain, difficulty walking, or be unable to move your arms or legs (paralysis). Many fractures heal with conservative treatment; however severe fractures may require surgery to realign the bones.

Spinal column and spinal cord

To understand spinal fractures, it is helpful to understand how your spine works (see Anatomy of the Spine). Your spine is made of 33 bones called vertebrae that provide the main support for your body, allowing you to stand upright, bend, and twist. In the middle of each vertebra is a hollow space called the spinal canal, which provides a protective space for the spinal cord (Fig. 1). The spinal cord serves as an information super-highway, relaying messages between the brain and the body. Spinal nerves branch off the spinal cord, pass between the vertebrae, to innervate all parts of your body.

What are spinal fractures?

Spinal injuries can range from relatively mild ligament and muscle strains (such as whiplash), to fractures and dislocations of the bony vertebrae, to debilitating spinal cord injuries (see Spinal Cord Injury). Spinal fractures and dislocations can pinch, compress, and even tear the spinal cord. Treatment of spinal fractures depends on the type of fracture and the degree of instability.

Fractures can occur anywhere along the spine. Five to ten percent occur in the cervical (neck) region. Sixty four percent occur in the thoracolumbar (low back) region, often at T12-L1.

There are numerous classifications for fractures. In general, spine fractures fall into three categories:

1. Fractures
2. Dislocations
3. Fracture-dislocations

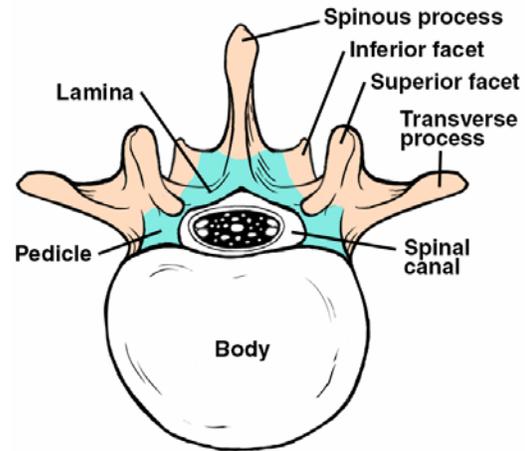


Figure 1. Vertebrae have 3 main parts. The body is a weight-bearing surface and an attachment for the disc. The vertebral arch forms the spinal canal through which the spinal cord runs. The processes arise from the vertebral arch to form the facet joints and processes for muscle attachment.

Whiplash

Whiplash is a common injury to the neck caused by hyperextension or rapid back and forth motion of the head - most often in a car accident. The jerking motion strains the muscles and ligaments of the neck and may cause the discs to bulge. Whiplash can lead to headaches, stiff muscles, or neck pain. It is important that a doctor examine a spine injury carefully. Whiplash is different than a spinal fracture or spinal cord injury and the symptoms usually improve with conservative treatment.

Spinal instability

Spinal instability is the excessive motion between vertebrae caused by stretched or torn ligaments and broken bone. Abnormal slipping and rubbing motions can cause pain and damage the spinal nerves or spinal cord. Stable fractures can usually be treated with bracing and rest. Unstable fractures usually require surgery to realign the bones and prevent spinal cord or nerve injury.

Fractures: when more pressure is put on a bone than it can stand, it will break. The most common type of spine fracture is a vertebral body compression fracture (Fig. 2). Sudden downward force shatters and collapses the body of the vertebrae. If the force is great enough, it may send bone fragments into the spinal canal, called a burst fracture.

People affected by osteoporosis, tumors, and certain forms of cancer that weaken bone are prone to vertebral compression fractures (VCF). The fracture appears as a wedge-shaped collapse of the vertebra. Multiple VCFs can cause a forward hunch of the spine called kyphosis.

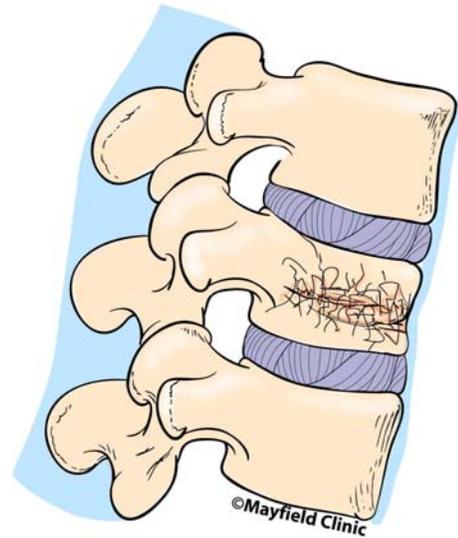


Figure 2. In a compression fracture, sudden downward force shatters the body of the vertebra.

Dislocations: when the ligaments and/or discs connecting two vertebrae together are stretched or torn, the bones may come out of alignment (Fig 3). For example, when the rapid forward motion of the upper body against a seat belt pulls apart the vertebra and stretches the ligaments. A dislocated vertebra can cause instability and spinal cord compression. They usually require stabilization surgery or a brace.

Fracture-dislocations: occur when bone is broken and the ligaments are torn (Fig. 4). These fractures are usually unstable, tend to be very debilitating, and are often surgically repaired.

What are the symptoms?

Symptoms of a spinal fracture vary depending on the severity and location of the injury. They include back or neck pain, numbness, tingling, muscle spasm, weakness, bowel/bladder changes, and paralysis. Paralysis is a loss of movement in the arms or legs and may indicate a spinal cord injury. Not all fractures cause spinal cord injury and rarely is the spinal cord completely severed.

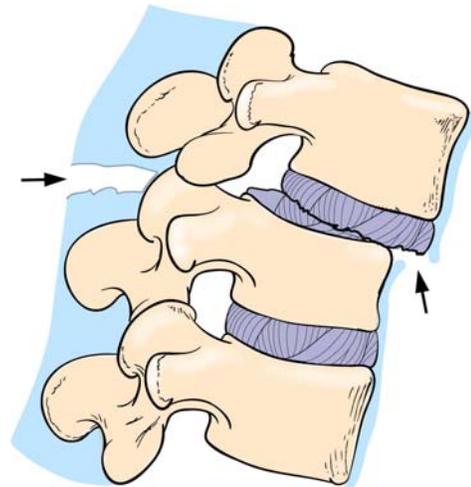


Figure 3. In a dislocation, the ligaments are stretched or torn allowing the vertebra to come out of alignment.

What causes spinal fractures?

Car accidents (45%), falls (20%), sports (15%), acts of violence (15%), and miscellaneous activities (5%) are the primary causes of spinal fractures. Diseases such as osteoporosis and spine tumors also contribute to fractures.

Who is affected?

- 80% of patients are aged 18-25 years
- Men are 4 times more likely to have a traumatic spinal fracture than women

How is a diagnosis made?

In most cases of a spinal injury, paramedics will take you to an emergency room (ER). The first doctor to see you in the ER is an Emergency Medicine specialist who is a member of the trauma team. Depending on your injuries, other specialists will be called to assess your condition. The doctors will assess your breathing and perform a physical

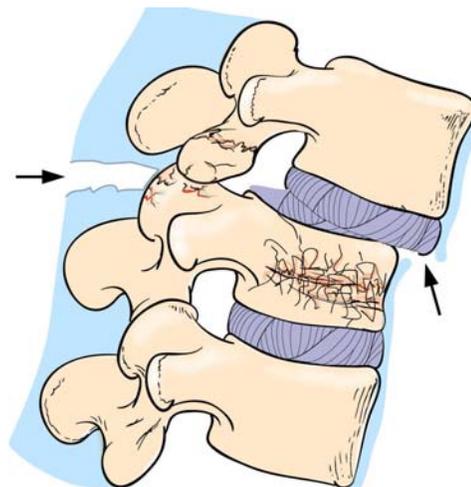


Figure 4. In a fracture-dislocation, both the bone and ligaments are disrupted.

exam of the spine. The spine is kept in a neck or back brace until appropriate diagnostic tests are completed.

X-ray test uses x-rays to view the bony vertebrae in your spine and can tell your doctor if any of them show fractures. Special flexion and extension x-rays may be taken to detect any abnormal movement.

Computed Tomography (CT) scan is a safe, noninvasive test that uses an X-ray beam and a computer to make 2-dimensional images of your spine. Similar to an MRI, it allows your doctor to view your spine in slices, as if it were sliced layer-by-layer and a picture taken of each slice. It may or may not be performed with a dye (contrast agent) injected into your bloodstream. It is especially useful for viewing changes in bony structures.

Magnetic resonance imaging (MRI) scan is a noninvasive test that uses a magnetic field and radiofrequency waves to give a detailed view of the soft tissues of your spine. Unlike an X-ray, nerves and discs are clearly visible. It allows your doctor to view your spine 3-dimensionally in slices, as if it were sliced layer-by-layer like a loaf of bread with a picture taken of each slice. The pictures can be taken from the side or from the top as a cross-section. It may or may not be performed with a dye (contrast agent) injected into your bloodstream. MRI is useful in evaluating soft tissue damage to the ligaments and discs, and assessing spinal cord injury.

What treatments are available?

Treatment of a fracture begins with pain management and stabilization to prevent further injury. Other body injuries (e.g., to the chest) may be present and need treatment as well. Depending on the type of fracture and its stability, bracing and/or surgery may be necessary.

Braces & Orthotics do three things, 1) maintains spinal alignment; 2) immobilizes your spine during healing; and 3) controls pain by restricting movement. Stable fractures may only require stabilization with a brace, such as a rigid collar (Miami J) for cervical fractures, a cervical-thoracic brace (Minerva) for upper back fractures, or a thoracolumbar-sacral orthosis (TLSO) for lower back fractures. After 8 to 12 weeks the brace is usually discontinued.

Unstable neck fractures or dislocations may require traction to realign the spine into its correct position. A halo ring and vest brace may be required.

Instrumentation & Fusion are surgical procedures to treat unstable fractures. Fusion is the joining of two vertebrae with a bone graft held together with hardware such as plates, rods, hooks, pedicle screws, or cages. The goal of the bone graft is to join the vertebrae above and below to form one solid piece of bone. It may take several months or longer to create a solid fusion.

Vertebroplasty & Kyphoplasty are minimally invasive procedures performed to treat compression fractures commonly caused by osteoporosis and spinal tumors. In vertebroplasty, bone cement is injected through a hollow needle into the fractured vertebral body. In kyphoplasty, a balloon is first inserted and inflated to expand the compressed vertebra before filling the space with bone cement.

Clinical trials

Clinical trials are research studies in which new treatments—drugs, diagnostics, procedures, vaccines, and other therapies—are tested in people to see if they are safe and effective. Research is always being conducted to improve the standard of medical care and explore new drug and surgical treatments. You can find information about current clinical investigations, including their eligibility, protocol, and participating locations on the web: the National Institutes of Health (NIH), www.clinicaltrials.gov, sponsors many trials; private industry and pharmaceutical companies also sponsor trials. www.centerwatch.com

Current Studies

Go to www.mayfieldclinic.com/ClinicalTrials.htm for information about clinical trials conducted by our doctors at local Cincinnati hospitals or call 1-800-325-7787 ext. 5260.

Sources & Links

If you have more questions, please contact the Mayfield Spine Institute at 800-325-7787 or 513-221-1100. Additional information is available on the web.

www.spineuniverse.com
www.spinalcord.org

Sources

www.emedicine.com/emerg/topic189.htm
www.emedicine.com/orthoped/topic567.htm

Glossary

- bone graft:** bone harvested from ones self (autograft) or from another (allograft) for the purpose of fusing or repairing a defect.
- fusion:** to join together two separate bones into one to provide stability.
- kyphoplasty:** a minimally invasive procedure used to treat vertebral compression fractures by inflating a balloon to restore bone height then injecting bone cement into the vertebral body.
- kyphosis:** abnormal curve of the thoracic spine, also called hunchback.
- ligament:** strong band of white fibrous connective tissue that joins bones to other bones or to cartilage in the joint areas.
- osteoporosis:** a loss of bone mass making them weak, brittle, and prone to fracture. Common in elderly women after menopause.
- spinal canal:** the hollow space within the bony vertebrae of the spine through which the spinal cord passes.
- spinal cord:** part of the central nervous system enclosed and protected by the spinal vertebrae; conducts messages, or impulses, back and forth between your brain and body to control sensation and movement.
- spinal instability:** abnormal movement between two vertebrae that can cause pain or damage the spinal cord and nerves.
- vertebra:** (plural vertebrae): one of 33 bones that form the spinal column, they are divided into 7 cervical, 12 thoracic, 5 lumbar, 5 sacral, and 4 coccygeal. Only the top 24 bones are moveable.
- vertebral compression fracture (VCF):** a break in the vertebral body of the spine causing it to collapse and produce a wedge-shaped deformity.
- vertebroplasty:** a minimally invasive procedure used to treat vertebral compression fractures by injecting bone cement into the vertebral body.
- whiplash:** an injury to the ligaments and muscles of the neck resulting from rapid acceleration or deceleration (as in an auto accident).

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