



The spine works as the main support for the spinal cord and the nerve pathways that carry information from the arms, legs, and rest of the body, and carries signals from the brain to the body.

Your back is composed of 33 bones called vertebrae, 31 pairs of nerves, 40 muscles and numerous connecting tendons and ligaments running from the base of your skull to your tailbone. Between your vertebrae are fibrous, elastic cartilage called discs. These "shock absorbers" keep your spine flexible and cushion the hard vertebrae as you move.

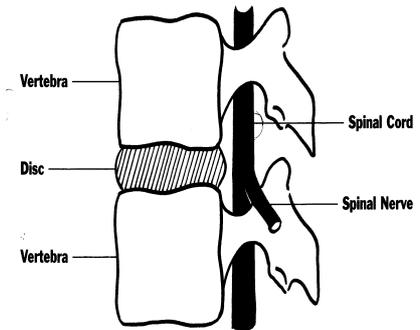
1) **Vertebrae:** "Bones of the neck and back;" provides structural support for the spine, protects and encases the spinal cord.

There are seven cervical bones or vertebrae. The cervical bones are designed to allow flexion, extension, bending, and turning of the head. They are smaller than the other vertebrae, which allows a greater amount of movement.

In the chest region the thoracic spine attaches to the ribs. There are 12 vertebrae in the thoracic region. The spinal canal in the thoracic region is relatively smaller than the cervical or lumbar areas. This makes the thoracic spinal cord at greater risk if there is a fracture.

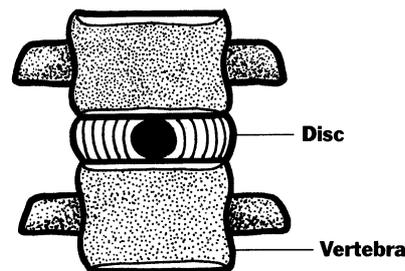
The motion that occurs in the thoracic spine is mostly rotation. The ribs prevent bending to the side. A small amount of movement occurs in bending forward and backward.

The lumbar vertebrae are large, wide, and thick. The main motions of the lumbar area are bending forward and extending backwards. Bending to the side also occurs.



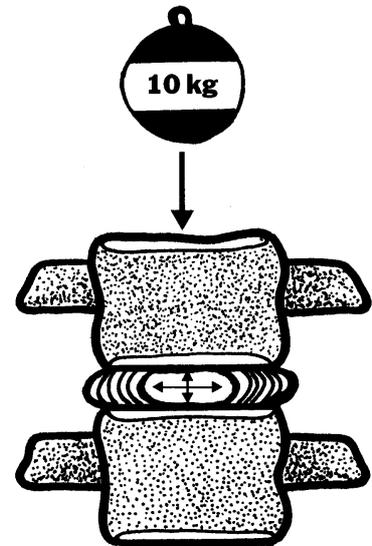
(2) **Discs:** Fibrous pads of cartilage which separate the vertebrae. The discs allow for flexibility in your spine, assist the muscles as shock absorbers, and provide cushioning between the vertebrae. The centre of the disc is called the nucleus pulposus, it is a jelly-like substance. The nucleus is surrounded by tough rings of tissue called the annulus, which is similar to a ligament.

The intervertebral disc has several important functions, including functioning as a spacer, as a shock absorber, and as a motion unit:

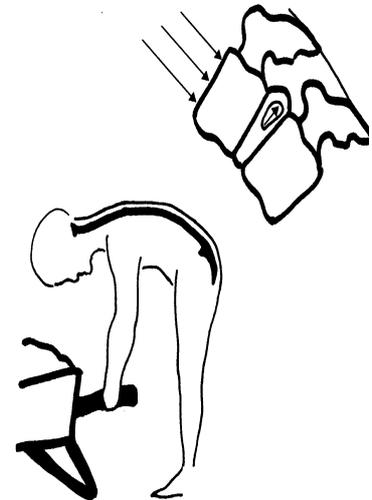


- **Spacer.** The height of the disc maintains the separation distance between the adjacent bony vertebral bodies. This allows biomechanics of motion to occur, with the cumulative effect of each spinal segment yielding the total range of motion of the spine in any of several directions. Proper spacing is also important because it allows the intervertebral foramen to maintain its height, which in allows the segmental nerve roots room to exit each spinal level without compression (e.g. a pinched nerve).

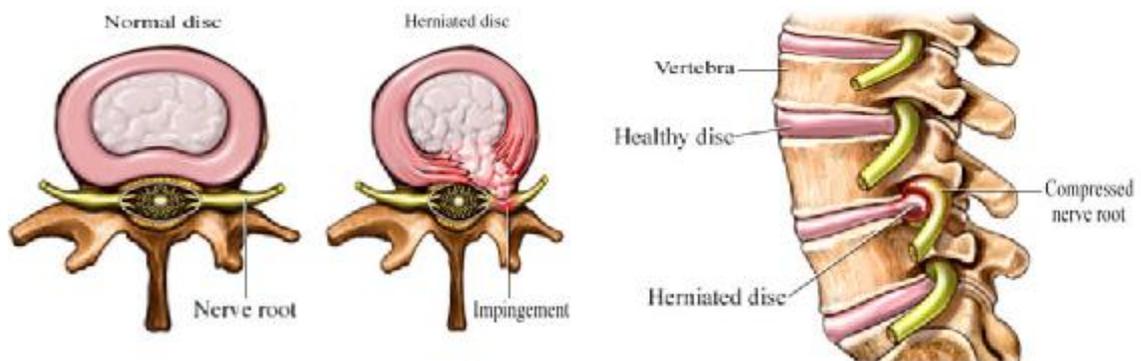
- **Shock absorber.** When these discs are healthy, they act as shock absorbers for the spine and keep the spine flexible. When these discs are damaged from an injury, normal wear and tear, or disease, they may bulge or break open (rupture). When a disc bulges or ruptures, it is called a herniated disc, or sometimes a slipped or ruptured disc. Shock absorption allows the spine to compress and rebound when the spine is axially loaded during such activities as jumping and running. Importantly, it also resists the downward pull of gravity on the head and trunk during prolonged sitting and standing. Herniated discs can occur in any part of the spine. More than 90% of herniated discs affect the lower back (lumbar spine). The remainder occur in the neck (cervical spine) and rarely in the upper back (thoracic spine).<sup>1</sup> Since herniated discs most commonly affect the low back, this topic focuses mainly on the lumbar area.



- Although injury to the outer covering, the capsule or annulus, of a disc can cause pain, often a *herniated disc* by itself does not cause any pain. Pain occurs when the membrane on the outside of the spinal cord or spinal nerves is irritated. Loss of function—such as weakness or altered sensation—can be caused by pressure from the herniated disc on the nerve roots or spinal cord. Pain or numbness may occur in the area of the body to which the nerve travels. For example, a herniated disc that presses on one of the nerve roots of the sciatic nerve—a large nerve that extends from the lower back down the back of the leg—may cause pain and numbness in the leg, a condition called sciatica. Sciatica is the most common symptom of a herniated disc in the lower back. *Herniated discs are common in people who perform heavy manual labour and those who drive motor vehicles for long periods of time.*



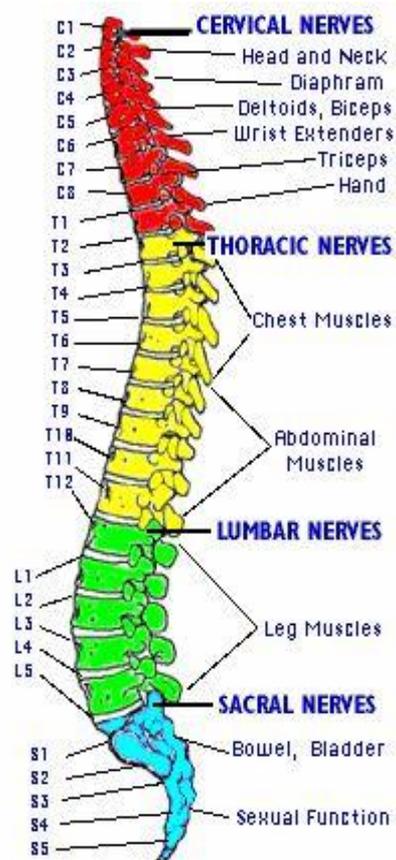
- **Motion unit.** The elasticity of the disc allows motion coupling, so that the spinal segment may flex, rotate, and bend to the side all at the same time during a particular activity. This would be impossible if each spinal segment were locked into a single axis of motion.



(3) **Spinal Nerves:** There are a number of pairs of spinal nerve roots, which branch off the spinal cord and exit through the intervertebral foramina (see number seven below) between each vertebra. They transmit sensory and motor impulses to and from parts of your body so that you can feel sensations and move your body.

Just like the spinal column is divided into cervical, thoracic, and lumbar regions, so is the spinal cord. Each portion of the spinal cord is divided into specific neurological segments. The cervical spinal cord is divided into eight levels. Each level contributes to different functions in the neck and the arms (see diagram). Sensations from the body are similarly transported from the skin and other areas of the body from the neck, shoulders, and arms up to the brain. In the thoracic region the nerves of the spinal cord supply muscles of the chest that help in breathing and coughing. This region also contains nerves in the sympathetic nervous system.

The lumbosacral spinal cord and nerve supply legs, pelvis, and bowel and bladder. Sensations from the feet, legs, pelvis, and lower abdomen are transmitted through the lumbosacral nerves and spinal cord to higher segments and eventually the brain



(4) **Facet Joint:** The joints which connect one vertebra to the vertebra above or below it. They are paired joints, which means that there is a left and right joint. They are located on the sides and behind the discs. Facet joints control the amount and direction of spinal movement.



(5) **Spinal Cord:** A bundle of nerve fibres that act as the "main cable," carrying both sensory and motor information between the body and the brain. Feelings from the body such as hot, cold, pain, and touch, are transmitted to the skin and other parts of the body to the brain where sensations are "felt." These pathways are called the sensory pathways.

Once signals enter the spinal cord, they are sent up to the brain. Different types of sensation are sent in different pathways, called "tracts." The tracts that carry sensations of pain and temperature to the brain are in the middle part of the spinal cord. These tracts are called the "spinothalamic." Other tracts carry sensation of position and light touch. These nerve impulses are carried along the back part of the spinal cord in what are called "dorsal columns" of the spinal cord.

(6) **Ligaments:** Tough, non-elastic bands that hold the vertebrae together and help limit the amount of movement of a joint. They may become too lax, causing joint hyper mobility (too much movement of a joint) and therefore pain.

(7) **Intervertebral:** On each side of the vertebral column there is an opening between each vertebrae called the intervertebral foramen. This opening enables the spinal nerves to pass through.

(8) **Muscles:** Elastic tissue that contracts to allow the body to move. Muscle groups may become weak or tight, causing a "muscle imbalance." This can directly affect full movement of the spine and extremities.

(9) **Tendons:** Fibrous tissue that connects muscle to bone.

(10) **Spinal Curves** The vertebrae are stacked on top of each other to form four continuous curves. They are as follows: cervical, thoracic, lumbar, and sacral curves. These curves allow for flexibility.

In its proper position, the spine follows natural curves, which allow for increased flexibility. These curves include:

- (1) Cervical (neck)
- (2) Thoracic (middle spine)
- (3) Lumbar (lower spine)
- (4) Sacral (base of the spine)

