DOWNLOAD PDF INTRODUCTION TO SPINAL ANATOMY

Chapter 1 : Thoracic & Lumbar Trauma Introduction - Spine - Orthobullets

Introduction to Spine Anatomy The spine is made up of a series of connected bones called "vertebrae," which encircle and protect the spinal cord. The disc is a combination of strong connective tissues that hold one vertebra to the next and acts as a cushion between the vertebrae.

This section highlights important structures in each category. Bones and Joints The human spine is made up of 24 spinal bones, called vertebrae. Vertebrae are stacked on top of one another to form the spinal column. Spine The first seven vertebrae make up the cervical spine. Doctors often refer to these vertebrae as C1 to C7. The cervical spine starts where the top vertebra C1 connects to the bottom of the skull. The cervical spine curves slightly inward and ends where C7 joins the top of the thoracic spine the chest area. Cervical Spine The base of the skull sits on top of C1, also called the atlas. Two thickened bony arches form a large hole through the center of the atlas. The opening is large because the spinal cord is wider where it first exits the brain and skull. Compared to other vertebrae, the atlas also has much wider bony projections pointing out to each side. Atlas The atlas sits on top of the C2 vertebra. The C2 is called the axis. The axis has a large bony knob on top, called the dens. The dens points up and fits through a hole in the atlas. The joints of the axis give the neck most of its ability to turn to the left and right. Axis Dens Each vertebra is made of the same parts. The main section of each cervical vertebra, from C2 to C7, is formed by a round block of bone, called the vertebral body. A bony ring attaches to the back of the vertebral body. This ring has two parts. Two pedicle bones connect directly to the back of the vertebral body. Two lamina bones join the pedicles to complete the ring. The lamina bones form the outer rim of the bony ring. When the vertebrae are stacked on top of each other, the bony rings form a hollow tube that surrounds the spinal cord. The laminae provide a protective roof over the spinal cord. Cervical Vertebra A bony knob projects out at the point where the two lamina bones join together at the back of the spine. These projections, called spinous processes, can be felt as you rub your fingers up and down the back of your spine. The largest bump near the top of your spine is the spinous process of C2. Spinous Processes Each vertebra in the spine has two bony knobs that point out to the side, one on the left and one on the right. These bony projections are called transverse processes. The atlas has the widest transverse processes of all the cervical vertebrae. Unlike the rest of the spine, the neck vertebrae have a hole that passes down through each transverse process. This hole, called the transverse foramen, provides a passageway for arteries that run up each side of the neck to supply the back of the brain with blood. Between each pair of vertebrae are two joints called facet joints. These joints connect the vertebrae together in a chain but slide against one another to allow the neck to move in many directions. Except for the very top and bottom of the spinal column, each vertebra has two facet joints on each side. The ones on top connect to the vertebra above; the ones below join with the vertebra below. Facet Joints The surfaces of the facet joints are covered by articular cartilage. Articular cartilage is a smooth, rubbery material that covers the ends of most joints. It allows the ends of bones to move against each other smoothly, without friction. On the left and right side of each vertebra is a small tunnel called a neural foramen. Foramina is the plural term. The two nerves that leave the spine at each vertebra go through the foramina, one on the left and one on the right. The intervertebral disc described later sits directly in front of the opening. A bulged or herniated disc can narrow the opening and put pressure on the nerve. A facet joint sits in back of the foramen. Bone spurs that form on the facet joint can project into the tunnel, narrowing the hole and pinching the nerve. Neural Foramen Nerves The hollow tube formed by the bony ring on the back of the spinal column surrounds the spinal cord as it passes through the spine. The spinal cord is a similar to a long wire made up of millions of nerve fibers. Just as the skull protects the brain, the bones of the spinal column protect the spinal cord. Spinal Cord The spinal cord travels down from the brain through the spinal column. Two large nerves branch off the spinal cord from each vertebra, one on the left and one on the right. The nerves pass through the neural foramina. These spinal nerves group together to form the main nerves that go to the limbs and organs. The nerves that come out of the cervical spine go to the arms and hands. Connective Tissues Ligaments are strong connective tissues that attach bones to other bones. Connective tissues are networks of fiber that hold the cells of the body together. Several long

ligaments connect on the front and back sections of the vertebrae. The anterior longitudinal ligament runs lengthwise down the front of the vertebral bodies. Two other ligaments run full length within the spinal canal. The posterior longitudinal ligament attaches on the back of the vertebral bodies. The ligamentum flavum is a long elastic band that connects to the front surface of the lamina bones. A special type of structure in the spine called an intervertebral disc is also made of connective tissue. The fibers of the disc are formed by special cells, called collagen cells. The fibers may be lined up like strands of nylon rope or crisscrossed like a net. An intervertebral disc is made of two parts. The center, called the nucleus, is spongy. It provides most of the shock absorption in the spine. The nucleus is held in place by the annulus, a series of strong ligament rings surrounding it. Two Parts of Intervertebral Disc Muscles The anterior cervical area is covered with muscles that run from the rib cage and collar bone to the cervical vertebrae, jaw, and skull. The posterior cervical muscles cover the bones along the back of the spine and make up the bulk of the tissues on the back of the neck. Spinal Segment A good way to understand the anatomy of the cervical spine is by looking at a spinal segment. Each spinal segment includes two vertebrae separated by an intervertebral disc, the nerves that leave the spinal cord at each vertebra, and the small facet joints that link each level of the spinal column. The intervertebral disc separates the two vertebral bodies of the spinal segment. The disc normally works like a shock absorber. It protects the spine against the daily pull of gravity. It also protects the spine during heavy activities that put strong force on the spine, such as jumping, running, and lifting. The spinal segment is connected by a facet joint, described earlier. When the facet joints of the cervical spine move together, they bend and turn the neck. Understanding the regions and structures of the neck can help you be more involved in your health care and better able to care for your neck problem.

Chapter 2 : Physical Therapy in Corpus Christi for Spinal Compression Fractures

A Patient's Guide to Anatomy and Function of the Spine Introduction. The spine is one of the most important parts of your body. Without it, you could not keep yourself upright or even stand up.

If you have a back problem or back pain, then having a basic understanding of the anatomy of your spine is essential to help you understand how you can manage or cure your back pain. Explaining the anatomy of the spine can be simple or difficult. We tend to think of our spines as a collection of interlinked bones - but there is a lot more to it than thatâ€¦ Sponsored links The Anatomy of the Spine Explained The back is a complex machine and one of the most important components of your body. It provides the structure that enables you to stand, move, bend and twist. It also provides strong protection to your spinal cord, is the main pathway connecting your brain to your nervous system. But it is not just the 33 interlinked bones vertebra you have to consider when thinking about what your spine is - you have to also consider the ligaments, tendons and muscles that work all in conjunction with one another. The spine has natural curves that form an S-shape Here I will go through the parts that make up the spinal system: The Bones, discs, nerves, bones, ligaments and muscles. Your spine is divided into five areas: To start with, your spine is made up of 33 individual bones that are stacked on top of each other. These 33 bones are divided into five regions or areas: Has 7 vertebrae known as C1-C7. This region runs from the stem of your brain down your neck Thoracic spine: Has 12 vertebrae known as T1-T This is the region of your upper and middle-back. Has five vertebrae known as L1-L5. Starts from below the shoulder blades down to your abdomen. Has five fused vertebrae known as the sacrum. Is found in the lower back, and extends to your tailbone Coccygeal spine: Has four fused vertebrae known as the coccyx. The very bottom section of your spine. Each vertebra in your spine is a bone made up of: A main body known as the vertebral body. Pedicles of bone coming from both sides and the back of the body which in turn forms joints with their neighbouring vertebra. Between each vertebral body lies a disc which acts as a cushion between the bones. Surrounding each vertebra are many ligaments, nerves, muscles and blood vessels. It is the close-packed nature of each spinal segment that influences the severity of the symptoms that you can experience if any of the above structures is damaged or moved from its location. A common example this would be when a disc oozes a tiny distance from its centre and impinge on a nerve. This can result in the nerve transmitting a raging sciatic pain down your leg.

DOWNLOAD PDF INTRODUCTION TO SPINAL ANATOMY

Chapter 3 : - Spine Anatomy Overview |

1 CHAPTER 1 Introduction to Spinal Anatomy MORPHOLOGY With a newborninfant, the spine as a whole exhibits a dorsal-facing convexity in the sagittal plane. During the first.

The disc is a combination of strong connective tissues that hold one vertebra to the next and acts as a cushion between the vertebrae. Nerves branch from the spinal cord and pass through openings in the vertebrae to other parts of the body. Several of these nerves join at the base of the spine to form the sciatic nerve, which runs down the leg. Normal spine anatomy The normal anatomy of the spine is usually described by dividing up the spine into 3 major sections: Below the lumbar spine is a bone called the sacrum, which is part of the pelvis. Each section is made up of individual bones called vertebrae. There are 7 cervical vertebrae, 12 thoracic vertebrae, and 5 lumbar vertebrae. An individual vertebra is made up of several parts. The body of the vertebra is the primary area of weight bearing and provides a resting place for the fibrous discs which separate each of the vertebrae. The lamina covers the spinal canal, the large hole in the center of the vertebra through which the spinal nerves pass. The spinous process is the bone you can feel when running your hands down your back. The paired transverse processes are oriented 90 degrees to the spinous process and provide attachment for back muscles. Determining Treatment Your SpineCenterAtlanta physician will take your medical history and perform a physical examination. A course of action will be designed and decided upon by you and your doctor. The best treatment for each patient must be based on an accurate diagnosis. Treatment must also be based on scientific evidence, not marketing on television or in news magazines. At SpineCenterAtlanta, we pride ourselves on making correct and complete diagnoses, and then offering our patients the most effective treatment for their unique problems. Spine surgery must be taken seriously. It is imperative to select the right procedure for the right patient at the right time. Contact our Atlanta Spine Anatomy Experts today for more information.

Chapter 4 : Anatomy of the Spine (Back & Neck) - Patients | DePuy Synthes Companies

An Overview of the Spine. The spine is a complex part of your body, and can be broken down into three main categories. The spinal column contains the bones that make up your spine, including the discs.

Anatomy of the Spine Overview The spine is made of 33 individual bones stacked one on top of the other. This spinal column provides the main support for your body, allowing you to stand upright, bend, and twist, while protecting the spinal cord from injury. Strong muscles and bones, flexible tendons and ligaments, and sensitive nerves contribute to a healthy spine. Yet, any of these structures affected by strain, injury, or disease can cause pain. Spinal curves When viewed from the side, an adult spine has a natural S-shaped curve. The neck cervical and low back lumbar regions have a slight concave curve, and the thoracic and sacral regions have a gentle convex curve Fig. The curves work like a coiled spring to absorb shock, maintain balance, and allow range of motion throughout the spinal column. The spine has three natural curves that form an S-shape; strong muscles keep our spine in alignment. The five regions of the spinal column. Good posture involves training your body to stand, walk, sit, and lie so that the least amount of strain is placed on the spine during movement or weight-bearing activities see Posture. An abnormal curve of the lumbar spine is lordosis, also called sway back. An abnormal curve of the thoracic spine is kyphosis, also called hunchback. An abnormal curve from side-to-side is called scoliosis. Muscles The two main muscle groups that affect the spine are extensors and flexors. The extensor muscles enable us to stand up and lift objects. The extensors are attached to the back of the spine. The flexor muscles are in the front and include the abdominal muscles. These muscles enable us to flex, or bend forward, and are important in lifting and controlling the arch in the lower back. The back muscles stabilize your spine. Something as common as poor muscle tone or a large belly can pull your entire body out of alignment. Misalignment puts incredible strain on the spine see Exercise for a Healthy Back. Vertebrae Vertebrae are the 33 individual bones that interlock with each other to form the spinal column. The vertebrae are numbered and divided into regions: Only the top 24 bones are moveable; the vertebrae of the sacrum and coccyx are fused. The vertebrae in each region have unique features that help them perform their main functions. Cervical neck - the main function of the cervical spine is to support the weight of the head about 10 pounds. The seven cervical vertebrae are numbered C1 to C7. The neck has the greatest range of motion because of two specialized vertebrae that connect to the skull. The first vertebra C1 is the ring-shaped atlas that connects directly to the skull. The second vertebra C2 is the peg-shaped axis, which has a projection called the odontoid, that the atlas pivots around. Thoracic mid back - the main function of the thoracic spine is to hold the rib cage and protect the heart and lungs. The twelve thoracic vertebrae are numbered T1 to T The range of motion in the thoracic spine is limited. Lumbar low back - the main function of the lumbar spine is to bear the weight of the body. The five lumbar vertebrae are numbered L1 to L5. These vertebrae are much larger in size to absorb the stress of lifting and carrying heavy objects. Sacrum - the main function of the sacrum is to connect the spine to the hip bones iliac. There are five sacral vertebrae, which are fused together. Together with the iliac bones, they form a ring called the pelvic girdle. Coccyx region - the four fused bones of the coccyx or tailbone provide attachment for ligaments and muscles of the pelvic floor. While vertebrae have unique regional features, every vertebra has three functional parts Fig. A vertebra has three parts: Discs are designed like a radial car tire. The outer ring, called the annulus, has crisscrossing fibrous bands, much like a tire tread. These bands attach between the bodies of each vertebra. Inside the disc is a gel-filled center called the nucleus, much like a tire tube Fig. Discs are made of a gel-filled center called the nucleus and a tough fibrous outer ring called the annulus. The annulus pulls the vertebrae bones together against the resistance of the gel-filled nucleus. Discs function like coiled springs. The crisscrossing fibers of the annulus pull the vertebral bones together against the elastic resistance of the gel-filled nucleus. The nucleus acts like a ball bearing when you move, allowing the vertebral bodies to roll over the incompressible gel. The gel-filled nucleus contains mostly fluid. This fluid is absorbed during the night as you lie down and is pushed out during the day as you move upright. With age, our discs increasingly lose the ability to reabsorb fluid and become brittle and flatter; this is why we get shorter as we grow older. Also diseases, such as

osteoarthritis and osteoporosis, cause bone spurs osteophytes to grow. Injury and strain can cause discs to bulge or herniate, a condition in which the nucleus is pushed out through the annulus to compress the nerve roots causing back pain. The arch is made of two supporting pedicles and two laminae Fig. The hollow spinal canal contains the spinal cord, fat, ligaments, and blood vessels. Under each pedicle, a pair of spinal nerves exits the spinal cord and pass through the intervertebral foramen to branch out to your body. The vertebral arch green forms the spinal canal blue through which the spinal cord runs. Seven bony processes arise from the vertebral arch to form the facet joints and processes for muscle attachment. Surgeons often remove the lamina of the vertebral arch laminectomy to access the spinal cord and nerves to treat stenosis, tumors, or herniated discs. Seven processes arise from the vertebral arch: Facet joints The facet joints of the spine allow back motion. Each vertebra has four facet joints, one pair that connects to the vertebra above superior facets and one pair that connects to the vertebra below inferior facets Fig. The superior and inferior facets connect each vertebra together. There are four facet joints associated with each vertebra. Ligaments The ligaments are strong fibrous bands that hold the vertebrae together, stabilize the spine, and protect the discs. The three major ligaments of the spine are the ligamentum flavum, anterior longitudinal ligament ALL , and posterior longitudinal ligament PLL Fig. The ALL and PLL are continuous bands that run from the top to the bottom of the spinal column along the vertebral bodies. They prevent excessive movement of the vertebral bones. The ligamentum flavum attaches between the lamina of each vertebra. The ligamentum flavum, anterior longitudinal ligament ALL , and posterior longitudinal ligament PLL allow the flexion and extension of the spine while keeping the bones aligned. Spinal cord The spinal cord is about 18 inches long and is the thickness of your thumb. It runs from the brainstem to the 1st lumbar vertebra protected within the spinal canal. At the end of the spinal cord, the cord fibers separate into the cauda equina and continue down through the spinal canal to your tailbone before branching off to your legs and feet. The spinal cord serves as an information super-highway, relaying messages between the brain and the body. The brain sends motor messages to the limbs and body through the spinal cord allowing for movement. The limbs and body send sensory messages to the brain through the spinal cord about what we feel and touch. Sometimes the spinal cord can react without sending information to the brain. These special pathways, called spinal reflexes, are designed to immediately protect our body from harm. Any damage to the spinal cord can result in a loss of sensory and motor function below the level of injury. For example, an injury to the thoracic or lumbar area may cause motor and sensory loss of the legs and trunk called paraplegia. An injury to the cervical neck area may cause sensory and motor loss of the arms and legs called tetraplegia, formerly known as quadriplegia. Spinal nerves Thirty-one pairs of spinal nerves branch off the spinal cord. Each spinal nerve has two roots Fig. The ventral front root carries motor impulses from the brain and the dorsal back root carries sensory impulses to the brain. The ventral and dorsal roots fuse together to form a spinal nerve, which travels down the spinal canal, alongside the cord, until it reaches its exit hole - the intervertebral foramen Fig. Once the nerve passes through the intervertebral foramen, it branches; each branch has both motor and sensory fibers. The smaller branch called the posterior primary ramus turns posteriorly to supply the skin and muscles of the back of the body. The larger branch called the anterior primary ramus turns anteriorly to supply the skin and muscles of the front of the body and forms most of the major nerves. The ventral motor and dorsal sensory roots join to form the spinal nerve. The spinal cord is covered by three layers of meninges: The spinal nerves are numbered according to the vertebrae above which it exits the spinal canal. The 8 cervical spinal nerves are C1 through C8, the 12 thoracic spinal nerves are T1 through T12, the 5 lumbar spinal nerves are L1 through L5, and the 5 sacral spinal nerves are S1 through S5. There is 1 coccygeal nerve. The spinal nerves exit the spinal canal through the intervertebral foramen below each pedicle. The spinal nerves innervate specific areas and form a striped pattern across the body called dermatomes Fig. Doctors use this pattern to diagnose the location of a spinal problem based on the area of pain or muscle weakness.

Chapter 5 : Anatomy of the Spine Article - Patients | DePuy Synthes Companies

- Gross Anatomy (macroscopic): Study of stuff seen by the naked eye. - Microscopic Anatomy: Study of stuff seen ONLY with the microscope. Includes: â€¢ Histology - Study of tissues â€¢ Cytology - Study of individual cells and their internal structures - Surface anatomy: Study of superficial markings.

Spinal cord anatomy 1. Internal anatomy of the spinal cord B. Spinal cord physiology 1. BP, and sweating, also causes dry mouth, How does information travel in the spinal Anatomy and Physiology Introduction. Identify terms related to Anatomy and Physiology. Autonomic nervous system involuntary controls organ systems and smooth muscle. Divisions of the Autonomic Nervous System. Human Anatomy and Physiology Source: Includes brain, spinal cord, and nerves. Responsible for fundamental functions. Mitotic division rate about X that of the human I can describe the parts of a neuron cell and identify how they transmit I can identify and explain different areas of the brain and their functions. Nervous tissue is excitable. Introduction to anatomy and physiology. Nerve Cell Basic structural unit nervous system Consists of: Human Anatomy and Physiology. Brain, spinal cord, nerves, sensory receptors. Allows the body to respond to irritants or Source: Chapter 8 Study Guide: The master controlling and communicating system of the body. What types of supporting cellsmake up central nervous Source: Brain and Spinal Cord All have dual sympathetic and parasympathetic innervation more in Human Anatomy, Introduction to Skeletal System. Is composed of the cranium brain case and the facial bones.

Chapter 6 : Spine Anatomy | Mayfield Brain & Spine, Cincinnati

Summary to Introduction to Spinal Anatomy. The vertebral column is constructed most amazingly to allow for the functions of the spine. In the intricate anatomy lies the wonder of the human spine. However, the potential for pathology is also genuine. Understanding the spine is my passion. Living a full life with a healthy back is my wish for you.

The Nervous System is divided into two main divisions. The spinal cord connect to the brain via the brainstem which is situated at the base of the brain. This is composed of the medulla, pons, and mid-brain. It is in the brainstem that discrete collections of nuclei are situated for the formation of 10 of the 12 cranial nerves. The brainstem and the cerebellum. Cerebral Cortex Cerebral Hemispheres of the Brain The cerebral hemispheres are composed of four major lobes Occipital Temporal medial part of which are a series of structures including the Hippocampus Frontal The outer layer of the cerebral hemisphere is termed the cerebral cortex. This is inter-connected via pathways that run sub-cortically. It is these connections as well as the connections from the cerebral cortex to the brainstem, spinal cord and nuclei deep within the cerebral hemisphere that form the white matter of the cerebral hemishere. Meninges The CNS is enclosed within the skull and vertebral column. These structures are separated by a series of membranes known as the Meninges. The Pia Mater is separated from the delicate arachnoid membrane by the subarachnoid space, which is then in turn separated from the Dura mater by the Sub-dural space. It is the focus of the cells metabolic processes, housing the mitochondria, golgi apparatus and peroxisomes. They produce many branches and transmit information towards the cell body from synapses on the dendritic tree. There is only one Axon per neuron. It can however, branch to produce several processes. The initial segment of the axon, as it emerges from the cell body, is the most excitable part of the neuron because it has a high density of sodium channels at this point. Therefore, it is at this point that the action potential is generated. A Lipid bilayer cell membrane encloses the neuron. It is within this that proteins are located. Some of these form ion channels, others form receptors to certain chemicals that are released by neurons. Others act as ion pumps, moving ions across the membrane. The Axolemma is the axonal surface membrane while the axoplasm is contained within it. Many axons are surrounded by a Myelin sheath. This alters the conducting properties of the axon, allowing for fast action potential propagation, while the strength of the signal is maintained. This is able to happen due to the gaps in the sheath called the Nodes of Ranvier which contain many ion channels. The myelin sheath surrounds the axon from the origin near the cell body along the length of the axon to the terminal, before the axon branches. The synapse is the junction where the neuron meets another cell. The physiology of synapses will be dealt with on the physiopedia page Introduction to Neuro-physiology. Form structural and supporting framework for neuronal cells and capillaries. They maintain integrity of blood brain barrier BBB. They store and release some neurotransmitters. Important role in development of NS and may have a role in injury recovery. Responsible for myelination of CNS neurons. Large numbers in the white matter. Clinical disorders of these cells cause central demyelination in conditions such as multiple sclerosis. Important for enabling movement of cerebrospinal fluid CSF as well as interacting with with Astrocytes to form a barrier separating the ventricles and CSF from neuronal environment. They line the central canal in the spinal cord. They are phagocytic in nature. Mediate immune responses within the CNS. Found only in the PNS. Responsible for the myelination of the peripheral nerves by wrapping the cell around the axon. Therre are multiple layers of scwann cell membrane wrapped around the nerve. One schwann cell wraps around one axon and provides myelin for one internode. They are important for regeneration of damaged peripheral axons. Anatomy of the Spinal Cord and Associated Pathways The spinal cord lies within the vertebral canal, extending from the foramen magnum to the lowest border of the first lumbar vertebra. It is enlarged at two sites, the cervical and lumbar region. The lower part of the spinal canal contains the lower lumbar and sacral nerves known as the Cauda Equina. The cell bodies for these neurons are situated in the dorsal root ganglia. Motor and preganglionic autonomic fibres exit via the ventral anterior root This short video clip gives an overview of spinal cord anatomy. Conveys pain and temperature. Dorsal column Medial lemniscal pathway: Afferents from mechanoreceptors, muscle and joint receptors. Forms medial lemniscus at this level and synapses in ventroposterior nucleus of thalamus.

Conveys proprioception, light touch and vibration. From spinal cord interneurons. It has two tracts a Dorsal SCT relays via inferior cerebellar peduncle and b VCT relays via superior cerebellar peduncle to the cerebellum. It conveys proprioceptive information and on-going activity in the spinal cord interneurons. Descending Motor Tracts Corticospinal pyramidal tract: From the motor cortex, premotor cortex, and somatosensory cortex. Has a role in sensory processing and fractionated finger movements. Originates from the magnocellular part of the red nucleus in the brain. It projects towards common structures with the CoST, particularly those involved with distal motor control. There is debate as to how significant this tract is. Originates from Deiters nucleus in the medulla and innervates the extensor and axial muscles. It is involved in balance control and posture. This tract begins in the caudal reticular formation in the pons and medulla. Provides both excitable and inhibitory effects on the interneurons in the spinal cord, and to a lesser extent, it also acts on the motor neurons. Its main action is to dampen down activity in the spinal cord. Alpha motorneurons are the largest motor neurons in the nervous system. They innervate skeletal muscle. Gamma Motorneurons innervate intrafusal muscle fibres of the muscle spindle. Motor neurons are arranged somatotopically across the ventral horn. The more medially placed MNs innervate proximal muscles while laterally placed MNs innervate distal muscles. Brainstem The brainstem is made up of the part of the brain that begins at the foramen magnum. It extends to the cerebral peduncles and thalamus.

Chapter 7 : Spinal Anatomy And Physiology PPT | Xpowerpoint

The Anatomy of the Spine Explained The back is a complex machine and one of the most important components of your body. It provides the structure that enables you to stand, move, bend and twist.

The vertebrae are named by the first letter of their region cervical, thoracic, or lumbar and with a number to indicate their position along the superior-inferior axis. For example, the fifth lumbar vertebra which is most inferior one, located beneath the fourth lumbar vertebra is called the L5 vertebra. Each vertebra has several important parts: Extending from the body, the transverse processes are thin columns of bone that point out to the left and right sides of the body. The spinous process extends from the ends of the transverse processes in the posterior direction. Between the body, transverse processes and spinous process is the vertebral foramen, a hollow space that contains the spinal cord and meninges. Between the vertebrae of the spine are thin regions of cartilage known as the intervertebral discs. Intervertebral discs are made of an outer shell known as the annulus fibrosus and a soft, pulpy region known as the nucleus pulposus in the middle. The annulus fibrosus is made of tough fibrocartilage that binds the vertebrae together but is flexible enough to allow for our movements. The vertebrae of the spine align so that their vertebral canals form a hollow, bony tube to protect the spinal cord from external damage and infection. Between the vertebrae are small spaces known as intervertebral canals that allow spinal nerves to exit the spinal cord and connect to the various regions of the body. There are 5 major regions of the spine: The 7 vertebrae in the neck form the cervical region of the spine. Cervical vertebrae are the thinnest and most delicate vertebrae in the spine but offer great flexibility to the neck. The skull pivots on the atlas when moving up and down. Thoracic vertebrae are larger and stronger than cervical vertebrae but are much less flexible. The spinous processes of the thoracic vertebrae point inferiorly to help lock the vertebrae together. A unique feature of the thoracic vertebrae is that each one forms joints with a pair of ribs to form the sturdy rib cage that protects the organs of the chest. The 5 vertebrae in the lower back form the lumbar region of the spine. Lumbar vertebrae are even larger and stronger than thoracic vertebrae, but are more flexible due to the lack of ribs in the lumbar region. The sacral region of the spine contains only the sacrum, a single bone in the adult skeleton that is formed by the fusion of 5 smaller vertebrae during adolescence. The sacrum is a flat, triangular bone found in the lower back and wedged between the 2 hip bones. The coccyx is often referred to as the human tailbone, as this region is homologous to the tail bones of animals that have tails. In humans, the coccyx bears our body weight when sitting down and provides attachment points for muscles of the pelvic and gluteal regions. While most people have a coccyx made of 4 fused vertebrae, the coccyx may consist of as few as 3 or as many as 5 vertebrae.

Chapter 8 : Spine - Anatomy Pictures and Information

A Patient's Guide to Cervical Spine Anatomy. Introduction. To learn much more about the individual parts of the spine you may wish to review the document, entitled.

Without it, you could not keep yourself upright or even stand up. It gives your body structure and support. It allows you to move about freely and to bend with flexibility. The spine is also designed to protect your spinal cord. The spinal cord is a column of nerves that connects your brain with the rest of your body, allowing you to control your movements. Without a spinal cord, you could not move any part of your body, and your organs could not function. This is why keeping your spine healthy is vital if you want to live an active life. Your spine is made up of 24 small bones vertebrae that are stacked on top of each other to create the spinal column. Between each vertebra is a soft, gel-like cushion called a disc that helps absorb pressure and keeps the bones from rubbing against each other. Each vertebra is held to the others by groups of ligaments. Ligaments connect bones to bones; tendons connect muscles to bones. There are also tendons that fasten muscles to the vertebrae. The spinal column also has real joints just like the knee or elbow or any other joints called facet joints. The facet joints link the vertebrae together and give them the flexibility to move against each other. Each vertebra has a hole in the center, so when they stack on top of each other they form a hollow tube that holds and protects the entire spinal cord and its nerve roots. The spinal cord itself is a large collection of nerve tissue that carries messages from your brain to the rest of your body. The spine branches off into thirty-one pairs of nerve roots. These roots exit the spine on both sides through spaces neural foramina between each vertebra. The spine itself has three main segments: The cervical is the upper part of the spine, made up of seven vertebrae. The thoracic is the center portion of the spine, consisting of 12 vertebrae. The lower portion of the spine is called the lumbar spine. It is usually made up of five vertebrae, however, some people may have six lumbar vertebrae. Having six vertebrae does not seem to cause a problem. Below the lumbar spine is the sacrum. The sacrum is actually a group of specialized vertebrae that connects the spine to the pelvis. The nerves that leave the spine in the sacral region control the bowel and bladder functions and give sensation feeling to the crotch area. This allows for an even distribution of weight. The cervical spine curves slightly inward, the thoracic curves outward, and the lumbar curves inward. A spinal segment is made up of two vertebrae attached together by ligaments, with a soft disc separating them. The facet joints fit between the two vertebrae, allowing for movement, and the neural foramen between the vertebrae allow space for the nerve roots to travel freely from the spinal cord to the body. The spinal segment allows us to focus on the repeating parts of the spinal column to better understand what can go wrong with the various parts of the spine. Sometimes problems in the spine involve only one spinal segment, while other times the problems involve multiple segments. Each spinal segment is like a well-tuned part of a machine. All of the parts should work together to allow weight bearing, movement, and support. When all the parts are functioning properly, all spinal segments join to make up a remarkably strong structure called the spinal column. When one segment deteriorates to the point of instability, it can lead to problems at that segment causing pain and other difficulties. Cervical Spine The cervical spine is made up of the first seven vertebrae in the spine. It starts just below the skull and ends just above the thoracic spine. The cervical spine is much more mobile than both of the other spinal regions - think about all the directions and angles you can turn your neck. Unlike the rest of the spine, there are special openings in each vertebra in the cervical spine for the arteries blood vessels that carry blood away from the heart , as well as the spinal canal that carries the spinal cord. The arteries that run through these openings bring blood to the brain. Two vertebrae in the cervical spine, the atlas and the axis, differ from the other vertebrae because they are designed specifically for rotation. These two vertebrae are what allow your neck to rotate in so many directions, including looking to the side. The atlas is the first cervical vertebra - the one that sits between the skull and the rest of spine. The atlas does not have a vertebral body, but does have a thick forward anterior arch and a thin back posterior arch, with two prominent sideways masses. The atlas sits on top of the second cervical vertebra - the axis. The axis has a bony knob called the odontoid process that sticks up through the hole in the atlas. It is this special arrangement that allows the head to turn from side to side as far as it can.

Special ligaments between these two vertebrae allow a great deal of rotation to occur between the two bones. Though the cervical spine is very flexible, it is also very much at risk for injury from strong, sudden movements, such as whiplash-type injuries. This high risk of harm is due to: This is a lot of weight for a small, thin set of bones and soft tissues to bear. Therefore, sudden, strong head movement can cause damage. Thoracic Spine The thoracic spine is made up of the middle 12 vertebra of the spine. These vertebrae connect to your ribs and form part of the back wall of the thorax the ribcage area between the neck and the diaphragm. This part of the spine has very narrow, thin intervertebral discs, so there is much less movement allowed between vertebrae than in the lumbar or cervical parts of the spine. It also has less space in the spinal canal for the nerves. Lumbar Spine The lowest part of the spine is called the lumbar spine. This area has five vertebrae. However, sometimes people are born with a sixth vertebra in the lumbar region. The base of your spine sacrum is a fusion of many bones, and when one of them forms as a vertebra rather than part of the sacrum, it is called a transitional or sixth vertebra. This occurrence is not dangerous and does not appear to have any serious side effects. The vertebrae in the lumbar spine area are the largest of the entire spine, so the lumbar spinal canal is larger than in the cervical or thoracic parts of the spine. Because of its size, the lumbar spine has more space for the nerves to move about. Low back pain is a very common complaint for a simple reason. Since the lumbar spine is connected to your pelvis, this is where most of your weight bearing and body movement takes place. Typically, this is where people tend to place too much pressure, such as: Such repetitive injuries can lead to damage to the parts of the lumbar spine. From the front of the body. The column classification is used to determine the stability of the spine. BMP-like products are proteins that enhance mineralization and which can increase bone formation during fusion operation. Bulge of the disc: Also called a prolapse or protrusion. Referring to the neck, the top seven vertebrae of the spine. Removal of the vertebral body, usually to remove pressure off of the spinal nerves. Degeneration of the disc: These changes can be seen on MRI scans, and are usually asymptomatic. Disc also spelled Disk: Extrusion of The Disc: Kyphosis - roundback when viewed from the side. The thoracic spine is normally kyphotic. The cervical and lumbar spines are normally lordotic. Signs include hyperreflexia heightened reflexes , balance difficulties, dropping items and lack of coordination, and bowel and bladder dysfunction. This structure is stressed and may fracture with extension and rotation of the lumbar spine. Prolapse of The Disc: Also called a bulge or protrusion. Protrusion of The Disc: Also called a prolapse or bulge. The curvature is usually associated with rotation of the vertebral bodies. Sequestration or Sequestered Disc: A long piece of bone or cage that is inserted into the space created by corpectomy to support struts the anterior column of the spine. The information on this site is solely for purposes of general patient education, and may not be relied upon as a substitute for professional medical care.

Chapter 9 : Introduction to Neuroanatomy - Physiopedia

Dr. Claudia Krebs and Dr. Wayne Vogl take us on a trip down the Spinal Cord. Written by Dr. Claudia Krebs, Tamara Bodnar, Parker Holman and Dr. Joanne Weinberg Produced and Directed by Zachary.

Compression fractures are the most common type of fracture affecting the spine. A compression fracture of a spine bone vertebra causes the bone to collapse in height. Compression fractures are commonly the result of osteoporosis. About , cases of compression fractures due to osteoporosis occur each year in the United States. Spinal bones that are weakened from osteoporosis may become unable to support normal stress and pressure. As a result, something as simple as coughing, twisting, or lifting can cause a vertebra to fracture. An injury to the spine, such as from a hard fall on the buttocks or blow to the head, can cause a spinal compression fracture. Compression fractures may also occur if cancer from other parts of the body spreads to the spine. Cancer weakens the spinal bones and makes them prone to fractures. This guide will help you understand: The human spine is made of 24 spinal bones, called vertebrae. Vertebrae are stacked on top of one another to create the spinal column. The spinal column gives the body its form. The main section of each vertebra is a large, round structure called a vertebral body. Compression fractures cause this section of bone to collapse. When the fracture is due to osteoporosis, it usually occurs in the lower part of the thoracic spine, near the bottom of the rib cage. A bony ring attaches to the back of each vertebral body. When the vertebrae are stacked on one another, the bony rings form a hollow tube. This tube, or canal, surrounds the spinal cord. The spinal cord is like a long wire made of millions of nerve fibers. Just as the skull protects the brain, the bones of the spinal column protect the spinal cord. Severe compression fractures from forceful impact on the spine, as can happen in a car accident, can cause fragments of the vertebral body to push into the spinal canal and press against the spinal cord. This can cause damage to the spinal cord that can result in partial or complete paralysis below the waist. It is rare for a typical compression fracture from osteoporosis to cause damage to the spinal cord. Compression Fractures Causes Why do I have this problem? Strong, healthy bones are able to withstand the forces and strains of normal activity. The vertebral body cracks under pressure. Fractures from forceful impact on the spine tend to crack the back posterior part of the vertebral body. Fractures from osteoporosis usually occur in the front anterior part of the vertebral body. Osteoporosis is a disease that weakens bone. Sometimes the bones in the spine weaken to the point that even mild forces can lead to a compression fracture. A simple action like reaching down to pull on a pair of socks can cause a weakened vertebra to fracture. The front of the vertebra the part closest to the front of the body crumbles, causing the round vertebral body to become wedge-shaped. This angles the spine forward, producing a hunch-backed appearance, called kyphosis. Diseases or conditions that affect the parathyroid gland can also weaken bones. Four pea-sized parathyroid glands are located just behind the thyroid gland in the throat. They produce a substance called parathyroid hormone PTH , which normally regulates the amount of calcium in the blood stream. An overactive parathyroid gland releases too much PTH, causing the body to leach calcium from bones, even when there is more than enough calcium circulating in the blood stream. This disorder is called hyperparathyroidism. It occurs when a tumor, called an adenoma, forms in one of the parathyroid glands. Cancers that affect the kidney, skin, or parathyroid gland may also cause the parathyroid gland to malfunction. Weakening in the spine bones makes the vertebrae more prone to crack in front, as is typical with osteoporosis. Cancers that form in other parts of the body have a tendency to spread, or metastasize, to the spine. When this happens, the cancer weakens the spinal bones, making them susceptible to compression fractures. Doctors may suspect unrecognized cancer if a patient has a compression fracture without any particular cause or reason. Spine trauma can produce mild or severe compression fractures. Compression fractures from trauma usually involve high forces that impact the spine when it is bent forward. This is typically what happens when a person falls onto the buttocks or strikes his head on the windshield in a car accident. Again, these traumatic fractures usually affect the back part of the vertebral body. Symptoms What does the condition feel like? Compression fractures caused by thin, weakened bones may cause little or no pain at first. Sometimes pain is centered over the area where the fracture has occurred. The collapsed vertebra gives the spine a hunched appearance, and the

loss of vertebral height shortens the muscles on each side of the spine. This forces the back muscles to work harder, causing muscle fatigue and pain. When pain does occur, it usually goes away after a few weeks. However, back pain sometimes escalates to the point that patients seek medical help. Traumatic compression fractures can produce intense pain in the back that spreads into the legs. If the fracture severely damages the vertebral body, bone fragments may lodge in the spinal canal, pressing on the spinal cord. This can paralyze muscles and impair sensation in the areas supplied by the damaged nerve tissue. Such a fracture may also cause the spine to become unstable. When this happens, the spine eventually tilts forward into increased kyphosis, and the potential grows for future complications with the spinal cord. Diagnosis How do health care professionals diagnose the problem? Diagnosis begins with a complete history and physical examination. These include questions about where you feel pain, when the pain started, what you were doing when the pain started, and if you have numbness or weakness in your limbs. Your Physical Therapist will also want to know what positions or activities make your symptoms worse or better. Next your Physical Therapist will do a physical examination. They will palpate, or touch, gently along your spine and surrounding tissues to determine the exact location of pain. Compression fractures often cause soreness and tenderness in the area over or near the fractured vertebra. Next they will ask you to actively move in different directions to determine which back movements cause pain or other symptoms and assess how restricted your range of motion is. Your skin sensation, muscle strength, and reflexes may also require testing. In addition, your Physical Therapist may also examine your hip joints as they are closely related to the proper functioning of the back. If your Physical Therapist deducts from the history and physical examination that your problem is potentially due to a compression fracture, we will refer you on to your doctor for further examination and investigations to help confirm this suspicion. X-rays can show fractures of the vertebrae. When an X-ray confirms a compression fracture, computed tomography a CT scan may be ordered. The image can show whether the compression fracture has caused the area to become unstable from the injury. If symptoms suggest problems with the spinal cord, the doctor may combine the CT scan with myelography. To do this, a special dye is injected into the space around the spinal canal the subarachnoid space. When the CT scan is performed, the dye highlights the spinal cord and spinal nerves. The dye can improve the accuracy of a standard CT scan for diagnosing the health of the spinal cord and spinal nerves. Magnetic resonance imaging MRI can show the doctor problems affecting the nerves or causing pain. The MRI machine uses magnetic waves rather than X-rays to show the soft tissues of the body. It shows problems in other soft tissues such as the discs and spinal cord. This machine creates pictures that look like slices of the area your doctor is interested in. The test does not require special dye or a needle. Your doctor may order a bone scan to get additional information. This involves injecting chemical tracers into your blood stream. The tracers then show up on special X-rays of your spine. The tracers build up in areas of extra stress to bone tissue. This test can show if there are any old compression fractures, which would alert the doctor to problems with osteoporosis. If you have osteoporosis, the doctor will suggest ways to prevent future problems. Treatment What treatment options are available? Nonsurgical Treatment The majority of patients with compression fractures are treated without surgery. Most compression fractures heal within eight weeks with simple remedies of medicine, rest, rehabilitation, and a special back brace. Most patients are given medication to control pain. Although medications can help ease pain, they are not designed to heal the fracture. With pain under control, patients find it easier to get up and move about, avoiding the problems that come from remaining immobile in bed. Patients are usually prescribed a short period of rest. This gives the fracture a chance to heal and aids in pain control. In some extreme cases, the doctor may have a patient stay in bed for up to one week.