



## Glossary of Neurosurgery Terms

Last Updated 09/2006

### - A -

**ACUTE** - Of abrupt onset, in reference to a disease.

**AKINESIA** - The inability to initiate movement, due to problems with selecting and activating motor programs in the brain. Also refers to prolonged paralysis or “freezing in place.”

**ANEURYSM** - An abnormal blood-filled swelling of an artery or vein, resulting from a localized weakness in the wall of the vessel. An aneurysm in the brain is referred to as a Cerebral or Intracranial Aneurysm.

**ANGIOGRAPHY** – Also called Angiogram. An imaging test that shows the blood vessels leading to and in the brain, in which a contrast dye is injected through a catheter placed in an artery in the groin or arm.

**ANNULAR TEAR** - A cracking of the rings inside the intervertebral disc. As the tear approaches the surface of the outer layers, nerve endings are negatively stimulated, leading to inflammation and pain.

**ANNULUS FIBROSIS** - The tough, fibrous outer portion of a disc. It is composed of multiple cartilaginous rings, which firmly attach to the vertebrae above and below the disc and help hold the segments together.

**ANTERIOR** - The reference to a spine surgery approach through the front of the neck or through the abdomen.

**ANTERIOR LUMBAR INTERBODY FUSION (ALIF)** – The spinal fusion technique in which the disc is removed through the abdomen and a bone graft is inserted in the intervertebral space also through the front.

**ARACHNOID** - The middle layer of membranes covering the brain and spinal cord.

**ARTHROSCOPY** - An examination of the interior of a joint with a small camera mounted at the tip of a tube that's inserted into the joint through a small incision in the skin. The instrument is called an arthroscope.

**ARTIFICIAL DISC** - An artificial disc, used in surgical replacement, is constructed from a polyethylene core sandwiched between two endplates made of a cobalt-chrome alloy.

**ARTIFICIAL DISC REPLACEMENT (ADR)** - The replacement of one or more damaged, diseased, or degenerated discs with artificial discs. This is an alternative to traditional spinal fusion approved by the FDA on October 26, 2004, for use in the United States. It restores the vertebrae above and below the disc to normal position and preserves the flexibility of the spine.

**AUTOGRAFT** - A bone graft or tissue taken from the patient and used for fusion in that patient. Typically, in spine surgery, the bone is taken from a part of the patient's pelvis.

**AVM (ARTERIOVENOUS MALFORMATION)** - An abnormal collection of entangled blood vessels in the brain that, because of the absence of capillaries, can invade healthy tissues, restrict blood flow to the brain and cause a brain hemorrhage.

---

Note: All definitions presented in the Glossary of Terms on the Northern Rockies Neurosurgeons Web site are compiled and provided solely for the education of the patient, and are not meant for official quotation or citation. While every effort has been made to keep these definitions accurate, helpful and up-to-date, it is not the intent of this compilation to supplant existing or future medical advice. Under no circumstances shall Northern Rockies Neurosurgeons be liable for any actions taken or omissions made from reliance on

- B -

**BACKBONE** – See Vertebral Column.

**BASAL GANGLIA** - A region located at the base of the brain composed of gray matter and four clusters of neurons. These nerve cells are responsible for body movement and motor coordination, and deficits in the area are significant contributors in movement disorders such as Parkinson's disease.

**BERRY ANEURYSM** – A saccular aneurysm with a narrow neck of origin and a stem resembling a berry.

**BIPLANE ANGIOGRAPHY** - An advanced X-ray system that allows for simultaneous imaging in two planes. This means blood vessels in the brain can be viewed from two different angles at the same time, significantly reducing diagnostic and procedure time, as well as risk to the patient.

**BLOOD** – The familiar red fluid in the body that contains white and red blood cells, platelets, proteins and other elements. The blood is transported throughout the body by the circulatory system, and functions in two directions: arterial (away from the heart) and venous (back to the heart).

**BLOOD PRESSURE** – The pressure of the blood within the arteries It is measured and recorded by two numbers: systolic pressure after the heart contracts and is the highest, and diastolic pressure before the heart contracts and is the lowest.

**BRADYKINESIA** – A term used to describe slowness of motion and delayed initiation of movement, which is common in early stages of movement disorders, such as Parkinson's disease.

**BRAIN ATTACK** – See Stroke.

**BRAIN PACEMAKER** – See Neurostimulator.

**BRAIN STEM** - The part of the brain that connects the spinal cord to the cerebral hemispheres. It is composed of the medulla, pons and midbrain and controls many basic functions such as respiration, circulation and alertness.

**BROCA'S AREA** - Refers to a section of the brain, located in the frontal lobe of the left hemisphere that is important for language processing, and coherent speech production. It is named after Pierre Paul Broca, the French physician who discovered it in 1861. People suffering from damage to this area may show a condition called aphasia, which makes them unable to create and comprehend grammatically complex sentences.

**BULGING DISC** - A condition in which the nucleus pulposus of the disc pushes out against the annulus fibrosis causing it to bulge, putting possible pressure on a nerve root.

- C -

**C#** - The letter C followed by a number identifies a specific vertebra in the cervical spine. For example, C3 is the 3rd vertebra in the cervical spine.

**CAROTID ARTERY** - The large artery on either side of the neck that supplies most of the cerebral hemisphere.

**CATHETER** - A small tube inserted in a body cavity duct or vessel to allow drainage or injection of fluids or access by surgical instruments.

**CAUDA EQUINA** - The bundle of spinal nerve roots arising from the end of the spinal cord and filling the lower part of the spinal canal.

**CAUTERIZE** - The act of cutting and sealing or clipping something within the body.

---

Note: All definitions presented in the Glossary of Terms on the Northern Rockies Neurosurgeons Web site are compiled and provided solely for the education of the patient, and are not meant for official quotation or citation. While every effort has been made to keep these definitions accurate, helpful and up-to-date, it is not the intent of this compilation to supplant existing or future medical advice. Under no circumstances shall Northern Rockies Neurosurgeons be liable for any actions taken or omissions made from reliance on

**CENTRAL NERVOUS SYSTEM (CNS)** – One of two major divisions of the body’s nervous system, the CNS is a collective term for the brain and spinal cord, and their corresponding nerves and cells. It is often called the “control network” and is responsible for regulating bodily functions, processing sensations and sending signals to different parts of the brain.

**CEREBELLUM** – Means “small brain” in Latin, and refers to the portion of the brain in the back of the head between the cerebrum and the brain stem. It is responsible for balance and equilibrium, muscle control, and coordination of voluntary movement. Damage to this part of the brain can interfere with a person’s ability to walk, talk and eat, and to perform other self-care tasks.

**CEREBRAL ANEURYSM** – See Aneurysm.

**CEREBRAL EDEMA** – A swelling of the brain due to increased fluids in or around the brain tissue. Edema occurs most often because of head trauma.

**CEREBROSPINAL FLUID (CSF)** – The fluid located inside the spine. A lumbar puncture or spinal tap will look for blood in the fluid, as this is a sign that there may be a hemorrhage.

**CEREBROVASCULAR** - Of or relating to the brain and the blood vessels that supply it.

**CEREBRUM** - The largest portion of the brain, divided into two (right and left) hemispheres that each contain four lobes: frontal, parietal, occipital, and temporal. Its functions include speech, memory, vision, personality and muscle control in certain parts of the body.

**CERVICAL** - Describing or related to the neck. Cervical vertebrae are the bones at the top of the spine, which are found in the neck. A cervical fracture is a break in the vertebrae in the neck.

**CIRCLE OF WILLIS** – Refers to a circle of arteries at the base of the brain. This area is where the majority of cerebral aneurysms develop. It is named after Thomas Willis, an English physician from the 17<sup>th</sup> century.

**CLINICAL DEPRESSION** – A mental state, marked by symptoms of depression (feelings of low self esteem, guilt, self reproach, withdrawal from interpersonal contact, physical disturbances, pessimism, etc.) that last two weeks or more and are so severe that they interfere with daily living.

**CLIP LIGATION** – See Microvascular Clipping.

**COCCYX** – (Also called the tail bone) The small bone at the end of the spinal column, formed by the fusion of four rudimentary vertebrae.

**COIL EMBOLIZATION** – (Also called Coiling or Endovascular Embolization) A relatively new, minimally invasive alternative for the treatment of cerebral aneurysms. Platinum coils are packed within the aneurysm in order to relieve pressure-circulating blood on the walls and prevent rupture. The coils are guided to the aneurysm through the use of a catheter inserted into a femoral artery at the groin.

**CONCUSSION** - A disruption, usually temporary, of neurological function resulting from a blow or violent shaking.

**CONGENITAL** - A condition that is congenital is one that is present at birth.

**CONTUSION (Brain)** - A bruise; an area in which blood that has leaked out of vessels is mixed with brain tissue.

**CORTEX** - The external layer of gray matter covering the hemispheres of the cerebrum and cerebellum.

**CRANIAL NERVES** – The 12 sets of nerves that originate from the brain stem, retina and nose. These mediate the special senses as well as provide the motor and sensory innervations of the head and neck.

---

Note: All definitions presented in the Glossary of Terms on the Northern Rockies Neurosurgeons Web site are compiled and provided solely for the education of the patient, and are not meant for official quotation or citation. While every effort has been made to keep these definitions accurate, helpful and up-to-date, it is not the intent of this compilation to supplant existing or future medical advice. Under no circumstances shall Northern Rockies Neurosurgeons be liable for any actions taken or omissions made from reliance on

**CRANIOTOMY** - An open neurosurgical procedure that requires removal of a portion of the skull in order to gain access to the brain and other intracranial structures.

**CRANIUM** - The part of the skull that holds the brain.

**CT SCAN (COMPUTED TOMOGRAPHY SCAN)** - A diagnostic imaging procedure that uses a combination of X-rays and computer technology to produce cross-sectional images (often called horizontal or vertical slices) of the body. CT scans are more detailed than general X-rays and can be used in any part of the body to look at bones, muscles fat or organs. The denser a material is, the whiter a volume of it will appear on the scan. In the brain, CT scans are primarily used for evaluating swelling from tissue damage in the head and in assessment of ventricle size. CAT (Computed Axial Tomography) scan was the original name for a CT scan, and both terms are often used interchangeably.

**CYBERKNIFE®** - A new minimally invasive approach to stereotactic radiosurgery that uses a combination of robotics and image guidance to deliver concentrated beams of radiation to intracranial targets, many of which are inoperable. The CyberKnife system (manufactured by Accuray) uses a highly flexible robotic arm, allowing access to tumors in difficult-to-reach locations. CyberKnife is able to locate the position of the tumor without the use of an invasive stereotactic head frame, and compensates for patient movement during treatment, constantly ensuring accurate targeting with sub-millimeter precision. The result is that physicians know exactly where the tumor is in real time, and can use maximum radiation without fear of harming surrounding healthy tissues.

## - D -

**DEEP BRAIN STIMULATION (DBS)** - A surgical reversible procedure used to treat patients with Parkinson's disease or essential tremors, who do not respond effectively to medications. The therapy involves implanting a device (brain pacemaker) to deliver mild electrical stimulation to block the brain signals that cause tremors, rigidity or slow movement.

**DEPRESSED SKULL FRACTURE** - A break in the bones of the head in which some bone is pushed inward, possibly pushing on or cutting into the brain.

**DEPRESSION** – See Clinical Depression.

**DIAGNOSTIC** - Test or process used to determine the source of a problem.

**DISC** - One of the cartilaginous, oval-shaped cushion wedges found between adjacent vertebrae of the spinal column. The primary functions of a disc are to absorb and transfer mechanical stresses and to provide for smooth movement. The disc also adds to stability of the spine by virtue of the fact that it operates on a pressure gradient system, and helps allow for normal turning and bending. Often, a disc may bulge beyond the vertebral body and compress the nearby nerve root, causing pain. The terms "slipped disc", "ruptured disc, " "prolapsed disc" and "herniated disc" are often used interchangeably even though there are subtle differences.

**DISC DEGENERATION** - The normal wear-and-tear process of the spine that occurs after multiple annular tears have developed, resulting in the inner portion of the disc drying out and losing ability to function as a shock absorber. This, in turn, causes the vertebrae to become closer together producing increased stresses on bones, joints and ligaments.

**DISCECTOMY** - A procedure involving surgical excision of the nucleus pulposus (inner portion of the disc) which has pushed or broken through the outer rings of the disc and placed pressure on neural elements.

**DISLOCATION** - A dislocation occurs when extreme force is put on a ligament causing the two bone ends to separate.

**DOME** - The round balloon-like portion of an aneurysm. The smaller portion of the aneurysm is called the neck.

**DOPAMINE** - A neurotransmitter, or chemical that transmits signals between nerve cells. It is present in regions of the brain that regulate movement, emotion, motivation and feelings of pleasure. Lack of dopamine is the primary cause of Parkinson's symptoms.

**DOPPLER** - A non-invasive study that uses sound waves to show the flow in a blood vessel and can be used to determine the degree of narrowing of the vessel. A wand is placed on the skin over the vessel to be imaged. This study has no risks and is not painful.

**DURA MATER** - A tough fibrous membrane, which covers the brain and spinal cord, but is separated from them by a small space.

**DYSPHASIA** - A speech problem characterized by trouble forming words.

**DYSKINESIA** - An impairment of the ability to perform voluntary movements.

**DYSTONIA** - A movement disorder characterized by sustained muscle contractions, usually producing twisting and repetitive movements or abnormal postures or positions.

## - E -

**ELECTROCARDIOGRAM (ECG or EKG)** - A diagnostic test that records the electrical activity of the heart, shows abnormal rhythms, and detects heart muscle stress.

**ELECTRODE** - A conductor through which electrical current enters or leaves.

**ELECTROENCEPHALOGRAPHY (EEG)** - A procedure that involves placement of electrodes on a patient's scalp to measure and record the brain's continuous electrical activity.

**ELECTROMYOGRAPHY (EMG)** - A method of recording the electrical currents generated in a muscle during its contraction.

**ENDOSCOPE** - A medical device for viewing internal body structures or cavities. It is usually comprised of fiber optic tubes and video display instrument.

**ENDOVASCULAR** – Within the blood vessels.

**ENDOVASCULAR EMBOLIZATION** – See Coil Embolization.

**ESSENTIAL TREMOR** - Essential tremor is a neurological disorder characterized by shaking of hands (and sometimes other parts of the body including the head), evoked by intentional movements. The incidence is unknown, but it is the most common type of tremor and also the most commonly observed movement disorder.

**EPIDURAL HEMATOMA** - A blood clot between the dura mater and the inside of the skull.

**EXTRADURAL TUMOR** - The most common spinal tumor, it occurs outside of the protective sheath of the spinal cord. It usually involves the bones and cartilage of the vertebrae. Most extradural tumors are metastatic — they spread to the spinal column from tumors that arise in other areas, most commonly the lungs, breasts, prostate, and kidneys.

## - F -

**FUSION** – See Spinal Fusion.

**FORAMINA** – Refers to one or more foramen, or holes, in the vertebral arch.

---

Note: All definitions presented in the Glossary of Terms on the Northern Rockies Neurosurgeons Web site are compiled and provided solely for the education of the patient, and are not meant for official quotation or citation. While every effort has been made to keep these definitions accurate, helpful and up-to-date, it is not the intent of this compilation to supplant existing or future medical advice. Under no circumstances shall Northern Rockies Neurosurgeons be liable for any actions taken or omissions made from reliance on

**FRAME-BASED STEREOTACTIC SURGERY** – Refers to a stereotactic surgery that utilizes a rigid metal frame fixed to a patient's skull to immobilize the head. The head is then imaged by CT, MRI or angiography scans to identify the tumor in relationship to the external frame. Since both the frame and the tumor are seen in the images, the distance can be measured in three dimensions. The advantage is the surgeon can continuously adjust to the target coordinates, especially for deep tumors within the brain that may be difficult and dangerous to approach by an open operation.

**FRAMELESS STEREOTACTIC SURGERY** – See Image-Guided Stereotactic Surgery.

**FREE-ELECTRON LASER (FEL)** – Also called "Scalpel of Light." A powerful laser (adopted from the Defense Department's "Star Wars" missile defense program) used in clinical operations to remove small tumors near vital nerves and arteries too risky to pursue with traditional brain surgery. Conventional lasers have been used in some forms of surgery for nearly three decades, but their use in neurosurgery has been limited due to the likelihood that they will damage areas surrounding the diseased tissue. The FEL, at a peak power of 10 megawatts, emits a beam of infrared light tuned precisely at 6.45 microns (6.45 thousandths of a millimeter), which allows it to powerfully cut through a variety of soft tissues with exceptional cleanliness. FEL technology was developed at Stanford University and used for the first time on a human patient by a team at Vanderbilt University (including Dr. Michael Copeland) on December 17, 1999. Since then, the infrared light has proven superior to other wavelengths, and future uses may also include: welding tissue to assist in wound healing, repairing nerves, reattaching retinas, and/or monitoring neurological activity.

**FRONTAL LOBE** - The frontal lobe, or the front part of the brain, has three general divisions: the prefrontal cortex, the premotor cortex, and the motor cortex. Problems with the frontal lobe can result in changes in movement, intelligence and behavior.

**FUSIFORM ANEURYSM** – An aneurysm without a stem.

## - G -

**GAMMA KNIFE** - An advanced form of stereotactic or focused radiosurgery for benign processes and metastatic brain tumors that were previously considered inoperable or very high risk for conventional brain surgery. The "knife" is formed by 201 intersecting beams of gamma radiation that deliver a concentrated dose to a precise area of the brain. Gamma Knife is not intended to replace conventional neurosurgery, but it is an effective additional tool, which may serve as a supplement to standard neurosurgical treatment or as the preferred course of treatment when traditional surgery is not appropriate.

**GENETIC PREDISPOSITION** - The inherited genetic pattern that may make some individuals more prone to certain conditions than others with a different genetic makeup

**GLASGOW COMA SCALE (GCS)** - The most widely used system of classifying the severity of head injuries or other neurological diseases.

**GLIA** - (Also called Neuro Glia) The major support cells of the brain. These cells are involved in the nutrition and maintenance of the nerve cells.

**GLIOMA** – The most common type of primary brain tumors that arise from the glial cells, or supportive tissue of the brain.

**GRAY or GREY MATTER** – Otherwise known as the cerebral cortex, or the "thinking matter" of the brain, this brain tissue is composed of nerve cells and blood vessels. It appears grayish because of the relatively high proportion of nerve cell nuclei that occur there. This is in contrast to white matter that consists mainly of axons.

- H -

**HEAD TRAUMA** – See Traumatic Brain Injury.

**HEMATOMA** - A localized collection of blood, usually clotted, caused by bleeding from a ruptured blood vessel.

**HEMORRHAGE** – A sudden and dramatic loss of blood, either internally or externally, from damaged blood vessels.

**HEMORRHAGIC STROKE** - A form of stroke that occurs when a blood vessel in the brain ruptures or bleeds.

**HERNIATED DISC** – When the nucleus pulposus (inner layer) of an intervertebral disc is displaced through a crack in the outer layer of the disc. With age, the center of a disc may start to lose water content, making the disc less effective as a cushion. When this occurs, the disc pushes out or ruptures, and presses into nerve roots in the spine - causing pain, numbness, tingling or weakness in the neck or back.

**HNP (HERNIATED NUCLEUS PULPOUS)** – See Herniated Disc.

**HYDROCEPHALUS** - A condition in which excess cerebrospinal fluid accumulates in the brain. It is often treated with the surgical placement of a shunt to divert the fluid from the brain.

**HYPERTENSION** - High blood pressure.

**HYPOTHALAMUS** - A collection of specialized nerve cells at the base of the brain, which controls the anterior and posterior pituitary secretions. They are involved in other basic regulatory functions such as temperature control and attention.

- I -

**IMAGE-GUIDED STEREOTACTIC SURGERY** – Also called Frameless Stereotactic Surgery. A minimally invasive surgical technique that uses images to guide the surgeon to a target within the cranium - very helpful for the accurate approach and removal of large brain tumors. Using an external, three-dimensional frame of reference (for instance, a combination of digitizing cameras, motion tracking software, fiber optic sensing technology and infrared emitters), the system correlates live radiographic images to determine tumor position. Rather than an invasive metal head or body frame, the patient is fitted with a custom mesh garment. Fiducial markers are taped to the scalp before the brain is imaged, and then the orientation of these markers is used to register the computer containing the brain images. The apparatus senses the position of the surgeon's instruments in space and indicates the position on the image displayed on the computer monitor in real time, as the operation proceeds. Thus, throughout the procedure, the surgeon is continuously monitoring the target and readjusting calibrations to assure that they are locked on the tumor. The main advantages with image-guided stereotactic surgery include: more precision in approach and navigation, limited surgical exposure, greater safety, and more complete tumor removal.

**INFLAMMATION** - A normal reaction to injury or disease, which results in swelling, pain, and stiffness.

**INTERBODY FUSION** - A bone graft in the space between discs for the purpose of fusing two vertebral segments.

**INTRACRANIAL** – Within the cranium.

**INTRACRANIAL PRESSURE (ICP)** - The overall pressure inside the skull. ICP measures CSF and the brain's blood supply in closed intracranial space. Most commonly due to head injury, a sudden or large increase in ICP can be life-threatening.

**INVASIVE PROCEDURE** - An operative procedure, major or minor, usually by cutting or puncturing the skin or by inserting instruments into the body.

---

Note: All definitions presented in the Glossary of Terms on the Northern Rockies Neurosurgeons Web site are compiled and provided solely for the education of the patient, and are not meant for official quotation or citation. While every effort has been made to keep these definitions accurate, helpful and up-to-date, it is not the intent of this compilation to supplant existing or future medical advice. Under no circumstances shall Northern Rockies Neurosurgeons be liable for any actions taken or omissions made from reliance on

**IPD (INTRASPINOUS PROCESS DECOMPRESSION)** – A minimally invasive surgical procedure for the treatment of spinal cord compression. Under local anesthesia, a titanium implant known as X-Stop® is fitted between the posterior parts of the vertebral body, giving the spinal cord and nerve roots more room. The procedure is not a fusion and preserves most structure and movement.

**ISCHEMIA** - The inadequate circulation of blood generally due to a blockage of an artery.

**ISCHEMIC STROKE** – The most common type of stroke (occurs in approximately 85 – 90% of stroke incidences) in which a blood vessel becomes occluded and the blood supply to part of the brain is totally or partially blocked.

**- J -**

**JOINT** - A point of articulation between two or more bones that allows motion.

**JUGULAR VEIN** - The major vein on each side of the neck, which drains blood from the head towards the heart.

**- K -**

**KYPHOSIS** - A curve in the spine that points to the back of the body.

**- L -**

**L#** - The letter L followed by a number identifies a specific vertebra in the lumbar spine. For example, L3 is the 3rd vertebra in the lumbar spine.

**LAMINA** - The flattened or arched part of the vertebral arch, forming the roof of the spinal canal.

**LAMINECTOMY** - A procedure involving surgical removal of the lamina (the bony arch or back of the vertebrae), which covers the nerve and allows for exploration of the disc and foramina.

**LAMINOTOMY** - An operation to form a hole in or remove part of the lamina, which is done to allow more room for the spinal cord and nerves.

**LEUKODYSTROPHY** – The disturbance of the white matter of the brain.

**LIGAMENT** - A white, shiny, flexible band of fibrous tissue that binds joints together and connects various bones and cartilage.

**LINEAR ACCELERATOR** – A machine that creates high-energy radiation to treat cancers, using electricity to form a stream of fast-moving subatomic particles.

**LIPOMA** - A benign fatty tumor, usually composed of mature fat cells.

**LORDOSIS** - A curvature of the spine with the convexity forward.

**LUMBAR** - The part of the spine between the thoracic spine and the pelvis.

**LUMBAR DRAIN** - A device, usually a long, thin, flexible tube, inserted through the skin into the cerebrospinal fluid of the lower back.

- M -

**MAGNETIC RESONANCE IMAGING (MRI)** – A diagnostic scanning technique that uses a combination of powerful magnets and radio waves in order to give a two-dimensional view of the brain or spinal cord. No X-rays or radiation are involved, but rather pulsed magnetic waves (often 30,000 times stronger than the earth's magnetic field) are used to delineate the structures within the brain and provide a computer-generated image. MRIs reveal the contrast between normal and abnormal tissues, and are often better than CT scans for viewing soft tissues. The procedure is physically painless, but some people find it psychologically uncomfortable to be in the small core of the MRI machine.

**MENINGES** - The three layers of membranes covering the spinal cord and brain termed: dura mater, arachnoid mater and pia mater.

**METASTATIC TUMOR** – A tumor that is malignant and spread from cancer in other parts of the body.

**MICROCATHETER** - A very small catheter used to deliver diagnostic and therapeutic agents, such as embolic devices used in the endovascular treatment of cerebral aneurysms.

**MICROELECTRODES** - Thin metallic tubes inserted into the brain and guided by stereotactic methods. They are connected to the operating room computer and used to measure the electrical signal from brain cells during surgical procedures.

**MICROGLIAL CELL** - A type of immune cell found in the central nervous system. Microglia are scavengers, engulfing dead cells and other debris and act when the brain is damaged by invading injured regions and devouring/removing damaged cells.

**MICROSURGERY** - Surgery utilizing a microscope's magnification to enable doctors to operate on very small areas. Microsurgery is used to target a specific area and to protect as much of the surrounding healthy tissue as possible.

**MICROVASCULAR CLIPPING** – Also called Clipping or Clip Ligation. One of the two major methods for treating cerebral aneurysms, microvascular clipping is the more common approach and involves cutting off the flow of blood to the aneurysm. The blood vessel that feeds the aneurysm is isolated and then a small titanium clip (similar to a clothes-pin) is placed across the neck (base). The clip remains in the patient and prevents the risk of future bleeding. Clipping has been shown to be highly effective, depending on the aneurysm itself, and in most cases, aneurysms that are completely clipped surgically do not return.

**MILIARY ANEURYSM** – An aneurysm that is tiny like a millet seed (about two millimeters in diameter). Miliary aneurysms tend to affect minute arteries in the brain or in the retina.

**MINIMALLY INVASIVE SURGICAL TECHNOLOGIES (MIS)** – Also called Endoscopic Technologies. A minimally invasive surgical procedure is defined as one that is carried out by entering the body through a natural opening or small incision in order to inflict the least amount of damage possible to surrounding tissues. Special medical equipment such as fiber optic cables, miniature video cameras (called endoscopes) and special surgical instruments are put in tubes inserted into the body via the small surface openings. The images of the interior body are then transmitted to an external video monitor. As an alternative to traditional surgery, MIS procedures reduce risk, pain, cost, procedure and recovery time. Due to these advantages, there is currently a powerful trend towards the development and adoption of more minimally invasive procedures.

**MOTOR CORTEX** – Also called Primary Motor. The motor cortex lies in the most posterior region of the frontal lobe. Nerves from the motor cortex carry signals to the brain stem and spinal cord, thus controlling and directing complex movements. Because the hemispheres control the body in a contra lateral fashion, nerves from the right motor cortex send signals to the left side of the body, while nerves from the left motor cortex send signals to the right side. Interestingly, the motor cortex is one section of the brain that can shrink or grow with time, as the size corresponds to how frequently a certain region (that corresponds to each body part) is used.

**MOVEMENT DISORDER** – Also called Motor System Disorder. Refers to several conditions, many of them neurodegenerative, that prevent normal movement. Some are characterized by either lack of movement (bradykinesia, hypokinesia, etc) or excessive movement (chorea, athetosis, dystonia, tremor). Besides Parkinson's, other conditions often defined as movement disorders include essential tremor, multiple system atrophy, progressive supranuclear palsy, Huntington's disease, Tourette's syndrome and cerebral palsy.

**MYELIN** - The protective sheathing that insulates and protects nerve cell fibers in the brain, optic nerve, and spinal cord.

**MYELOGRAM** — An X-ray examination of the spinal canal using a dye injected into the spinal cord.

- N -

**NEURO GLIA** – See Glia.

**NEUROMA** - A tumor or new growth largely made up of nerve fibers and connective tissue.

**NEURON** – One of two major classes of cells within the nervous system. Neurons can be classified into one of three major types: sensory, motor and interneurons. They generate and propagate action potentials and communicate with each other through billions of connections termed synapses.

**NEUROIMAGING** – The use of various techniques to either directly or indirectly image the structure and function of the brain. Structural imaging deals with the structure of the brain and the diagnosis of large-scale intracranial diseases and tumors. Functional imaging is used to diagnose metabolic diseases and lesions on a finer scale, and also for neurological and cognitive science research.

**NEUROLOGICAL** - Having to do with the nerves or the nervous system.

**NEUROPATHY** - The abnormal function of nerves.

**NEUROSTIMULATOR** – An electrode connected to a power source (containing a small battery and programmable computer chip) implanted just under the skin in the upper chest wall. It is similar to a cardiac pacemaker, and is used in deep brain stimulation to send mild electrical currents to a target in the brain in order to block the signals that control tremors (a symptom of Parkinson's disease).

**NEUROSURGERY** – The surgical practice involved with the management and treatment of disorders of the brain, spine, spinal cord, and nervous system.

**NON-INVASIVE PROCEDURE** - A diagnostic or therapeutic technique, such as a CT scan, MRI or X-ray, that does not require the penetration of the body as by incision or injection.

**NUCLEUS PULPOSUS** - The jelly-like filling within the center of the intervertebral disc that gives it its shock absorbing quality. It has a high fluid content in early years and dries out with age.

- O -

**OCCIPITAL LOBE** – The region in the back of the head, which processes visual perception, and integrates it with auditory and sensory information. Damage to this lobe can cause deficits in visual reception or visual association, such as recognition of objects and colors.

**OCCIPUT** - The back part of the head.

**OCCLUSION** – To block off. A related procedure to microvascular clipping in which the surgeon clamps off (occludes) the entire artery that leads to the aneurysm. An occlusion is sometimes accompanied by a bypass, in which a small blood vessel is surgically grafted to the brain artery, rerouting the flow of blood away from the section of the damaged artery.

**OSTEOMA** - A benign bone tumor.

**- P -**

**PAIN** – An unpleasant sensation that can range from mild localized discomfort to agony. The physical part of pain results from nerve stimulation, and the emotional part from specific nerve fibers that carry the pain impulses to the brain.

**PALSY** - Antiquated term referring to paralysis or an uncontrollable shaking of the body.

**PARIENTAL LOBES** - The two parietal lobes are located at the top of the brain, behind the frontal lobes. Their main functions are to receive and process information about temperature, touch and movement coming from other parts of the body. The right parietal lobe contains the primary sensory cortex, which controls sensations like touch and pressure, as well as artistic capability. The left parietal lobe is associated with science capability and controls fine sensations like judgment, texture, weight, size and shape. Damage to this area of the brain can result in spatial deficits, the inability to recognize and discriminate different body parts, difficulties in eye and hand coordination, and problems with writing.

**PARKINSON'S DISEASE (PD)** – A neurodegenerative disorder of the central nervous system. Parkinson's disease affects various parts of the body, causing stiffness in the muscles, slowness, difficulty when starting movements, and tremor. As these symptoms become more pronounced, patients may have difficulty walking, talking, or completing other simple tasks. The disease is both chronic, meaning it persists over a long period of time, and progressive, meaning its symptoms grow worse over time. Parkinson's was discovered and its symptoms documented in 1817 in an "Essay on the Shaking Palsy" by the British physician Dr. James Parkinson.

**PARS INTERARTICULARIS** – A thin portion of the vertebral arch that joins the superior and inferior articular facets.

**PEDICLE** - The projection of bone from the back of a vertebra that helps form the ring around the spinal canal.

**PERCUTANEOUS** – Passage through skin by needle or other object.

**PERIPHERAL NERVOUS SYSTEM (PNS)** - The portion of the nervous system that consists of the nerves and neurons that reside or extend outside of the CNS – to serve the limbs and organs. The PNS is divided into the somatic nervous system (voluntary control of body movements through the action of skeletal muscles), and the autonomic nervous system (regulation of involuntary body functions, including those of the heart and intestine).

**PET SCAN (POSITRON EMISSION TOMOGRAPHY SCAN)** – A special type of X-ray, which shows areas of the brain and the heart that have a higher or lower activity than normal. PET scans measure blood flow and metabolism within body tissues, and detect abnormalities in how they work. They are often used when an MRI scan alone is inconclusive.

**PILL-ROLLING** - One of the characteristic slower tremors in the fingers of Parkinson's patients; the alternating movements of the thumb and forefinger give the appearance of rolling a small object between the fingers.

**PITUITARY** - (the "Master Gland") The gland at base of the brain that secretes hormones into the blood stream. Those hormones then regulate other glands including the thyroid, adrenals and gonads.

**POSTERIOR** - The reference to a spine surgery approach through the back side of the cervical or lumbar spine.

**POSTERIOR LUMBAR INTERBODY FUSION (PLIF)** – The spinal fusion technique in which the disc is removed through the lower back of the spinal canal and a bone graft is inserted in the intervertebral space also through the back.

**PREFRONTAL CORTEX** - The prefrontal cortex of the frontal lobe is important for the “higher cognitive functions,” including planning, organization, problem solving, selective attention, personality, and the control of emotional expression.

**PREMOTOR CORTEX** - The premotor cortex of the frontal lobe works in association with the motor area to execute movement in our daily activities. It helps by planning movement before the motor cortex actually sends the commanding signals to the body.

**PROCESSES** - A projection of bone from the vertebrae connected by muscles and ligaments. Behind the vertebral body, there are two transverse processes and one spinous process. The spinous process comes out the back, and one transverse process extends from each the left and right side. This portion of the bone is often the area to which a bone graft is affixed for a spinal fusion.

**PSYCHOSURGERY** – Brain surgery intended to relieve severe and otherwise intractable mental or behavioral problems.

## - R -

**RADIOSURGERY** – Also called Radiotherapy. A medical procedure that allows non-invasive brain surgery (without opening the skull) by means of a precise dosage of ionized radiation. These beams are used to destroy intracranial tumors and other lesions that could be otherwise inaccessible or inadequate for open surgery.

**RESIDENCY** - In the United States, neurosurgeons undergo a training program, known as a residency, consisting of five to seven years of postgraduate study in neurosurgery (following a mandatory one-year surgery internship). After completing their residency training, some neurosurgeons undertake advanced subspecialty training in programs known as fellowships which are typically one or two years in duration.

**RUPTURED DISC** – See Herniated Disc.

## - S -

**SACCULAR ANEURYSM** – The most common form of cerebral aneurysms and refers to those with a sack-like outpouching.

**SACRUM** – The part of the tailbone just above the coccyx and below the lumbar spine.

**SCIATICA** – Irritation of the sciatic nerve resulting in pain or tingling running down the inside of the leg.

**SCOLIOSIS** – An abnormal curve of the spine.

**SHUNT** - A tube or device implanted in the body to re-divert excess CSF away from the brain to another place in the body.

**SPECT (SINGLE PHOTON EMISSION COMPUTED TOMOGRAPHY)** - Similar to PET, this scan uses gamma ray-emitting radioisotopes to record data, which a computer then uses to construct three-dimensional images of active brain regions and cerebral brain flow.

**SPINAL CANAL** – The spinal canal is the space through which the spinal cord passes. The canal is enclosed within the intervertebral foramen (holes) of the vertebral arch.

**SPINAL CORD** – The spinal cord is a part of the central nervous system, enclosed in the spinal canal and protected in the vertebral column.

**SPINAL FUSION** – A surgical procedure performed to immobilize painful or unstable spinal segments by combining two or more vertebrae. Bone is grafted across a section of the vertebra, thus fusing the area and restricting motion between the segments. Often used to treat degenerative disc disease, but also used to treat scoliosis, kyphosis, fractures and tumors.

**SPINAL STENOSIS** - Narrowing of the nerve openings either around the spinal cord or nerve roots that can cause symptoms similar to a pinched nerve. In the neck, it is referred to as cervical spinal stenosis or CSS, and in the back, as lumbar spinal stenosis or LSS.

**SPINE** – See Vertebral Column.

**STEREOTACTIC SURGERY** – An advanced form of surgical intervention that makes use of a system of three-dimensional coordinates for locating points within the brain - to treat previously inoperable or surgically complex tumors with radiation. This technique may utilize an external frame attached to the head (Frame-based) or imaging markers attached to the scalp (Frameless or Image-Guided Surgery) to orient the surgeon in his approach. Stereotactic comes from a Greek word meaning “movement in space.”

**STROKE** – Also called Brain Attack. Occurs when the blood supply to the brain is interrupted and brain tissue is deprived of the oxygen and nutrients it needs. The result is that brain cells begin to die within minutes. Stroke is a medical emergency and can cause permanent neurologic damage or even death if not promptly diagnosed and treated.

**SUBARACHNOID HEMORRHAGE (SAH)** - The type of brain hemorrhage in which blood from a ruptured blood vessel spreads over the surface of the brain. The most common cause is a ruptured aneurysm.

**SUBSTANTIA NIGRA** – A small area of the brain, in the basal ganglia, that contains a cluster of black-pigmented nerve cells which produce dopamine. Degeneration of cells in this region may lead to a neurologic movement disorder such as Parkinson's disease

## - T -

**T#** - The letter T followed by a number identifies a specific vertebra in the thoracic spine. For example, T3 is the 3rd vertebra in the thoracic spine.

**TEMPORAL LOBES** - There are two temporal lobes, one on each side of the brain, typically located at just about the ear level. The temporal lobes are responsible for hearing, taste, smell, language and short-term memory. The right temporal lobe is mainly involved in visual memory, such as pictures or faces, while the left temporal lobe is mainly involved in verbal memory, such as words and names.

**TERATOMA** – A tumor or growth made up of several different types of tissue (fat, bone, muscle, skin).

**THORACIC** – The mid-upper back, chest area between the cervical (neck region) and lumbar (low back) spine.

**TRANSECTION** – A complete tear in the spinal cord.

**TRAUMATIC BRAIN INJURY** (Also referred to as TBI or Head Trauma) - Any injury to the brain resulting from the application of external physical forces to the skull. When a particular area is struck, penetrate or pierced, a diminished or altered state of consciousness occurs and can result in an impairment of cognitive abilities, behavioral disturbances or physical functioning.

**TREMOR** - Rhythmic involuntary movements (fast or slow) involving the arms, legs or head, occurring in numerous illnesses and conditions and greatly varying in type and severity.

---

Note: All definitions presented in the Glossary of Terms on the Northern Rockies Neurosurgeons Web site are compiled and provided solely for the education of the patient, and are not meant for official quotation or citation. While every effort has been made to keep these definitions accurate, helpful and up-to-date, it is not the intent of this compilation to supplant existing or future medical advice. Under no circumstances shall Northern Rockies Neurosurgeons be liable for any actions taken or omissions made from reliance on

**TUMOR** – A mass created by an abnormal and uncontrolled growth of cells. Tumors can be benign (non-cancerous) or malignant (cancerous).

- U -

**ULTRASOUND** - The use of high-frequency sound to create images of internal body structures.

- V -

**VAGUS NERVE** - The vagus nerve is tenth of twelve paired cranial nerves and is the only nerve that starts in the brainstem (somewhere in the medulla oblongata) and extends all the way down past the head, right down to the abdomen. The vagus nerve is arguably the single most important nerve in the body, and affects many areas such as: the heart, lungs, stomach, ears, pharynx, larynx, trachea, esophagus, the majority of the autonomic functions and internal organs.

**VALVE** – A device placed in a shunt system to regulate the rate and direction of the cerebrospinal fluid flow.

**VASOCONSTRICTION** – A decrease in the diameter of blood vessels.

**VASODILATATION** – An increase in the diameter of blood vessels.

**VASOPRESSOR** – An agent that constricts the arteries and raises blood pressure.

**VASOSPASM** - Refers to a condition in which blood vessels spasm, leading to vasoconstriction. Vasospasm is a major contributor to post-operative stroke and death after brain injury, aneurysm repair and any other source bleeding within the brain. Vasospasm may not appear until 4 to 8 days after injury.

**VENTRICLES** – The two lower chambers of the heart. The right ventricle sends blood to the lungs and the left ventricle passes blood while carrying oxygen to the rest of the body.

**VENTRICULAR DRAINAGE** – The insertion of a small tube into the ventricles to drain cerebrospinal fluid, usually when pressure is increased.

**VERMIS** – The middle part of the cerebellum between the two hemispheres.

**VERTEBRAE** – Referring to more than one vertebra.

**VERTEBRAL ARCH** – The posterior segment of a typical vertebra. The vertebral arch is formed by a foramen, a pair of pedicles and a pair of laminae, and supports seven processes (four articular, two transverse, and one spinous).

**VERTEBRAL BODY** – The anterior segment of a typical vertebra. When articulated with the vertebral arch, the bodies form a strong pillar for the support of the head.

**VERTEBRAL COLUMN** (Also called Spine or Backbone)– Refers to the column of vertebrae in the dorsal torso: thirty-three individual bones of the spine, sizes and shapes of which correspond to functional needs and location. In all, there are seven cervical, twelve thoracic, and five lumbar vertebrae. The sacrum typically consists of five vertebrae that are fused into one bone and four coccygeal bones.

**VERTIGO** – A dizzying or spinning sensation.

**VESSEL** – A tube in the body that carries fluids, like a blood or lymph vessel.

- W -

**WERNICKE'S AREA** - Wernicke's area lies in the temporal lobe and is most typically found in the left hemisphere, as this is where the majority of people have brain areas specialized for language skills. The German neurologist Karl Wernicke discovered in 1874 that damage to this area could cause a type of aphasia, resulting in a pronounced impairment of language comprehension and speech. One theory of language production holds that Wernicke's area is responsible for individual words, while Broca's area is responsible for grammar.

**WHITE MATTER** – Nerve tissue that is paler in color than gray matter because it contains nerve fibers with large amounts of insulating material (myelin). In the brain, the white matter lies within the gray layer of the cerebral cortex.

- X -

**X-RAY** – The application of electromagnetic radiation to produce a film or picture of a bone or soft-tissue area of the body.

**X-STOP (EXTENSION STOP) ®** – A titanium implant, used in IPD procedures, that is fitted between the spinous processes in order to relieve symptoms of patients when they bend forward or flex their spines.