

# THE BRAIN AND NERVOUS SYSTEM



The brain is made up of more than 12 billion neurons (nerve cells) and 50 billion supporting cells (neurons) — all weighing less than three pounds. The brain and the spinal cord, referred to as the central nervous system (CNS), regulate many unconscious body processes (eg, heart rate) and most of the body's voluntary movements. It is also the place where consciousness and intellectual functions allow a person to think, make decisions, and create.

Neurologists and neurosurgeons are specialists who treat various nervous system disorders. A diagnosis can be difficult, but diagnostic techniques, such as magnetic resonance imaging (MRI), are improving the ability to define nervous system diseases. The CNS is vulnerable to disturbances of blood vessels (strokes) and degeneration of nerve cells (Alzheimer's and Parkinson's disease). Meningitis and encephalitis result from inflammation of the brain. Injuries to the head may cause structural damage. Problems in mental processing can interfere with learning abilities. Seizures are caused by abnormal activity of nerve cells. Neuralgias are painful problems that affect nerves.

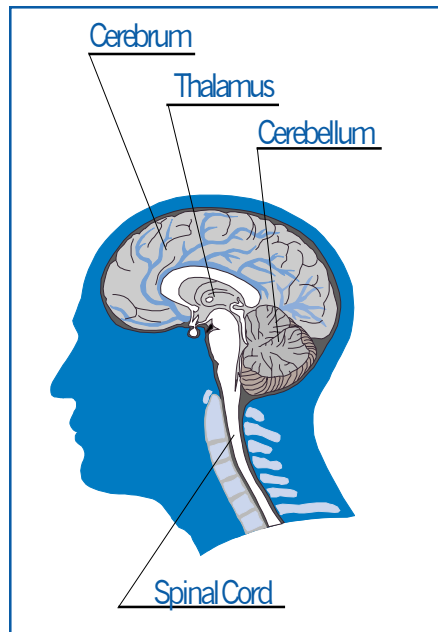


## CEREBROVASCULAR DISORDERS

Cerebrovascular disorders consist of any problem that affects the blood vessels that supply the brain.

### ■ EXTRADURAL HEMATOMA

Extradural (also called epidural) hemorrhage occurs after an injury to the head when a blood vessel (usually an artery) ruptures between the outer surface of the dura mater (the tough, fibrous membrane which forms the outer envelope of the brain and the spinal cord) and the skull. Blood then forms a mass (hematoma) that compresses the brain tissue. These injuries often cause unconsciousness and brain impairment — some that last for a few minutes and some that last a lifetime. Head injuries are common, but only approximately 10 percent require hospitalization.



### ■ SUBDURAL HEMORRHAGE

Subdural hemorrhage is caused by an injury to the head. The hemorrhage occurs when blood vessels rupture between the brain and the dura mater. The leaking blood forms a hematoma (blood blister) that compresses the brain tissue. Such leaking may occur slowly over a long period of time.

#### SIGNS AND SYMPTOMS

Steady or fluctuating headache; drowsiness; seizures or confusion after a head injury; partial paralysis on one side of the body; slowed thinking or changes in personality.

#### DRUG TREATMENT

Corticosteroids and diuretics control other fluids accumulating after a head injury that result in swelling of the brain.

#### SURGICAL TREATMENT

Surgery, (hole in the skull) or craniotomy, may be required to remove the blood. After surgery, anticonvulsant drugs may be prescribed to prevent posttraumatic seizures. Some hematomas are small and resolve without surgery and may not cause symptoms.



## ■ STROKE

Stroke is the most serious of the vascular disorders. In America, 500,000 strokes occur each year with approximately one-third of the victims dying, one-third left with a disability, and one-third making a good recovery. This is also known as a cerebral vascular accident (CVA). A stroke is a sudden disruption of the brain's blood supply by a bloodclot, (thrombosis or embolus) or the loss of blood onto the brain's surface or deep in the tissues (hemorrhage). In 80 percent of strokes, the problem is a clot that clogs a blood vessel in the head. Any interruption of the blood supply to the brain starves the nerve cells of oxygen and nutrients and can result in a loss of function — either temporary or permanent. Unless the hemorrhage is stopped or the clot dislodged, the brain or a portion of the brain may die and often causes a partial paralysis. Since stroke is often related to certain medical conditions, close supervision is advised for hypertension, atherosclerosis, heart disease, or diabetes.

If you experience one or more of the following warning signs (released by the American Heart Association), especially on only one side of the body, see a doctor immediately.

### SIGNS AND SYMPTOMS

Sudden weakness; numbness or paralysis of the face, arm, or leg; sudden dimness or loss of vision; loss of speech, trouble talking, or understanding language; sudden severe headache with no apparent cause; unexplained dizziness, unsteadiness, or sudden falls (especially with any of the above symptoms).

### EMERGENCY TREATMENT

Life support equipment to supply oxygen, nutrients, and medications is used for a patient who is severely threatened or in a coma; a catheter is often used to drain the bladder; and if the patient cannot swallow, a nasogastric tube will be inserted to supply nutrition. Sometimes a stroke is less severe and requires less intensive care.

### DRUG TREATMENT

There is no medication to cure a stroke once it occurs. Anticoagulants or a blood thinner may be used to prevent brain damage.

### SURGICAL TREATMENT

Surgery may be done with the use of a drain if there is hemorrhage into surrounding tissues. If an aneurysm (bulging of the wall of a blood vessel) has ruptured, a craniotomy (a surgical opening into the skull) may be needed to clip (seal) the ruptured aneurysm. In the case of a chronic (long term) condition, carotid endarterectomy (removing the core of an artery) may be used to remove plaque deposits for prevention of further strokes.



## ■ TRANSIENT ISCHEMIC ATTACK (TIA)

A transient ischemic attack (TIA) is caused by a temporary interruption of the blood supply to the brain. This causes stroke-like symptoms but most episodes last only a few minutes. The most common cause is an embolism (a tiny blood clot from somewhere else in the body) or by atherosclerosis (plaque deposits forming inside the arteries). The major risk factors contributing to TIAs are high blood pressure, some types of heart disease, smoking, diabetes, and advanced age.

**SIGNS AND SYMPTOMS** Sudden onset of weakness; tingling or numbness involving one side of the body; double vision or vision loss; speech difficulty; vertigo; imbalance; incoordination of the limbs.

**DRUG TREATMENT** Hypertension medication is generally given first if the patient suffers from high blood pressure. Aspirin may be prescribed to thin the blood.

**SURGICAL TREATMENT** A surgical procedure (endarterectomy) may be done to remove arterial plaque from the carotid artery for prevention of further TIAs.

## REHABILITATION AFTER STROKE OR HEAD INJURY

Recovery and rehabilitation depends on the part of the brain that is affected. In addition to physical side effects, depression is a common response to a stroke. Affected individuals may feel helpless, frustrated, and uninterested in activities they once enjoyed. The professional rehabilitation team normally includes a rehabilitation physician, a nurse, a dietitian, a physical therapist, a recreational therapist, a speech therapist, a social worker, a psychologist, and a clergyman. This skilled team contributes much to a patient's recovery. The most important and effective long term help may come from family and friends, and it must be given with patience and persistence.



## DEGENERATIVE DISORDERS

### ■ ALZHEIMER'S DISEASE/DEMENTIA

Dementia is a syndrome (collection of symptoms) where mental function breaks down. It worsens with time and includes personality change, confusion, and lack of energy. The disease prevents the brain cells from communicating with one another. Thinking, reasoning, memory, and judgment are all affected. Some forms of dementia are caused by a specific neurological or medical disease and may be treatable. Alzheimer's disease is the most common form of dementia. It is due to a degeneration of brain cells. The cause of Alzheimer's disease is unknown. New drugs are being studied as treatments for Alzheimer's disease. Some may be effective. The particular behavioral patterns of the disease depend on which area of the brain is affected.

#### SIGNS AND SYMPTOMS

Gradual loss of memory for recent events; inability to learn new information; growing tendencies to repeat oneself, misplace objects, become confused, and get lost; slow disintegration of personality, judgment, and social abilities; increasing irritability, anxiety, depression, and restlessness.

Many signs and symptoms, such as memory loss, are really part of aging, but also may be part of an organic condition such as vitamin B12 deficiency, hypothyroidism, or depression. An adverse reaction to a medication (particularly sedatives, narcotics, tranquilizers), or even subdural hematomas or intracranial bleeding may also cause memory loss.

Alzheimer's disease is usually not an acute condition. Abrupt changes in mental status may be due to other diseases, and they require medical attention.

#### DRUG TREATMENT

Cognex (Warner Lambert), Aricept (Pfizer, Eisai) have recently been released for treatment of the disease. The results of these newer medications will require long term investigations.



### ON THE HORIZON

Although further research is needed, there may be some insight into delaying or preventing Alzheimer's disease. Nonsteroidal anti-inflammatory drugs (NSAID), Vitamin E, Eldepryl (a drug for Parkinson's disease), and estrogen (in women only) have shown promise in delaying the onset of typical symptoms.



## ■ AMYOTROPHIC LATERAL SCLEROSIS (ALS)

Amyotrophic lateral sclerosis (ALS) is a progressive degeneration of nerve cells that control the voluntary muscles in the brain and spinal cord. It is commonly known as Lou Gehrig's disease. The cause of ALS is unknown. The nerve cells shrink and disappear with no other signs of abnormality. The muscle tissues then waste away because the nerves that stimulated them are gone. It is not contagious and may be hereditary as occasionally, other family members are affected. Men are affected more frequently. The onset is gradual. The disease may be well advanced before realizing medical help is needed. At this time, there is no known cure for ALS.

### SIGNS AND SYMPTOMS

Gradual loss of strength and coordination in one or more limbs; muscle twitches or cramps; increasing stiff, clumsy gait; swallowing, speaking or breathing difficulties (late stage).

### TREATMENT

Individually designed therapy to use and keep muscle function and support in the early stages of the disease, is the most effective treatment. The disease does not effect the mind. Currently, there is no known cure for ALS. A new drug, Riluzole, is being studied in patients with ALS.

Resources: The ALS Society of America.

## ■ CEREBRAL PALSY

Cerebral palsy refers to a group of disorders caused by injuries to the cerebral area that occur before, during, or soon after birth. The damage may cause paralysis (palsy) in one or more parts of the body. It is one of the most common crippling childhood disorders. The cause is not proven but the most frequent findings (without underlying disease) that are linked with this disease are inadequate blood or oxygen supply to the fetus, premature birth, birth trauma, and diseases of infancy (meningitis, encephalitis or herpes simplex), subdural hemorrhage, or blood vessel damage. There are three main types of cerebral palsy:

**Spastic cerebral palsy** This is the most common and the mildest form. It may have varying degrees of paralysis in paired limbs (paraplegia), one side of the body (hemiplegia), or all four extremities (quadriplegia).

**Dyskinetic or athetoid type** This is more common than Ataxic cerebral palsy but occurs less often than Spastic cerebral palsy. Infants may have abrupt, abnormal, involuntary movement, such as twisting or writhing. The involuntary movements disappear in sleep.

**Ataxic cerebral palsy** This is the least common form occurring in about 10 percent of cases. The child may have a tremor, unsteadiness, incoordination, choreal movements (see Huntington's chorea), and possibly seizures.

**SIGNS AND SYMPTOMS**

Full or partial spastic paralysis or weakness in one or more limbs; tremor or other involuntary movements; vision, speech, or hearing disorders; occasionally, mental retardation.

It is difficult to diagnose cerebral palsy in early infancy, although some babies exhibit symptoms after six months. These babies may tend to tuck their arms into their sides, cross their legs in a scissor-like fashion, or point their feet downward from the ankle. Once the symptoms develop, tests may be necessary to rule out other causes.

**TREATMENT**

The treatment is to develop the child's maximal level of independence. Regular attendance in school is encouraged. Physical and occupational therapy may be necessary.

**DRUG TREATMENT**

Muscle relaxants are given to ease muscle stiffness and anticonvulsants are given to reduce seizures.

## ■ ESSENTIAL TREMOR

An essential tremor is not a life-threatening condition. When there is a family history, it is called familial tremor. The rhythmic tremor may range from a moderate to a rapid frequency (6 to 10 tremors per second). Stress may increase the rhythmic shaking of an essential tremor. It usually appears during activity and disappears during sleep. Avoidance of caffeine, and other central nervous system stimulants, is important — they do increase the tremor.

**SIGNS AND SYMPTOMS**

Rhythmic, alternating movement of the hands, arms, head, tongue, or larynx; arm and head symptoms become worse with use.

**DRUG TREATMENT**

Propranolol (a beta blocker), is used to reduce tremor, slow the heart rate, and lower the blood pressure.

Mysoline (an antiseizure drug) and tranquilizers are also used.

Often, treatment is unnecessary.

## ■ FRIEDREICH'S ATAXIA

Friedreich's ataxia is a rare, inherited disease. The symptoms begin in youth and are due to nerve fiber degeneration in the spinal cord, peripheral nerves, or cerebellum. The diagnosis relies on a family history and on eliminating the possibility of other diseases. Survival beyond early adulthood is rare because of impairment of the heart muscles (myocardia). No treatment is yet available.



## ■ HUNTINGTON'S CHOREA

Huntington's chorea is a progressive degenerative and inherited disease that causes certain nerve cells in the brain to waste away. The onset occurs usually between 35 and 50 years of age. Younger patients have a more serious course. If one parent has the single faulty gene, the chance that an offspring will have the defect is 50 percent. Because the onset is near middle age, young parents have difficulty knowing the chances for occurrence of this disorder in their children. If a family history includes this disease, genetic counseling is recommended before having children.

**SIGNS AND SYMPTOMS** Wide, prancing gait; hesitant speech; involuntary jerky movements in arms, neck, and trunk; personality changes; intellectual deterioration.

**TREATMENT** Medication may be prescribed to lessen some of the symptoms.

## ■ MULTI-INFARCT DEMENTIA

Multi-infarct dementia is caused by a series of strokes that leave areas of dead brain cells (infarcts). The disorder produces a step-by-step degeneration in mental ability, with each step corresponding to a stroke. Short term memory is usually affected first.

**SIGNS AND SYMPTOMS** Gradual loss of memory; disintegration of personality with increasing depression; sudden involuntary laughing and crying; partial paralysis of one side of the body.

**TREATMENT** Prevention of a stroke is the only effective treatment for this dementia. If high blood pressure is present, this should be treated.



## ■ MULTIPLE SCLEROSIS (MS)

Multiple sclerosis (MS) is an autoimmune disease of the central nervous system. This common disabling disorder affects the young — one in every 1,000 people. The susceptibility to MS is acquired before 15 years of age. MS can cause periods of blurred or double vision, partial paralysis, clumsiness, and walking difficulties. There are times when symptoms diminish or even disappear (remission), but gradually, the symptoms increase and become a major disability in adults. The cause of MS is not completely understood, but medical research is very active in finding a cure or a prevention. MS is thought to be due to immune system damage to the myelin sheath of the nerves. Microphages, a type of scavenger cell, are suspected of removing the damaged section of myelin so that fibers are exposed and unable to conduct their normal impulses. The risk of having MS is ten times greater if a relative has the disease. MS is found in approximately 1 to 3 cases per thousand population in the U.S. Women have a slightly higher risk than men. Currently, there is no known cure for MS.

### SIGNS AND SYMPTOMS

Numbness; weakness, or paralysis in one or more limbs; impaired vision with pain during movement in one eye; tremor; lack of coordination, or unsteady gait; rapid, involuntary eye movement.

### DRUG TREATMENT

Intravenous methyl prednisone (corticosteroid) can help and reduce relapse, with corticotropin and oral prednisone as alternative therapies.

Beta Interferon and Copaxone have been shown to be effective and prolong the intervals between relapses. Some research has shown this drug to slow down the progress of MS but side effects have limited its use with some patients.

Baclofen and newly approved tizanidine are effective treatments for muscle stiffness (spasticity).



## ■ PARKINSON'S DISEASE

Parkinson's disease is also called shaking palsy or paralysis agitans and is a degenerative condition of the brain that occurs in about one in 200 people over the age of 60 (more men than women). It causes weakness, stiffening of the muscles, interference with speech, walking, and everyday tasks. There is little change in facial expression and the hands often have a tremor. The cause is unknown despite much research.

### SIGNS AND SYMPTOMS

Shaking at rest (tremor); reduction of facial expression; slowness of movement; shuffling gait; stiffness or rigidity of limbs; slow, low-pitched, monotone voice; difficulty maintaining balance; stooped posture; small, illegible handwriting; difficulty in speech, swallowing, and chewing.

### TREATMENT

In the early stages of the disease, a great deal of care may not be needed. It is important to exercise, eat a healthy diet, and stay socially active.

### DRUG TREATMENT

Levodopa is used to reverse the problems of walking, movement, and tremors. Carbidopa is designed to reduce the side effects of Levodopa and make Levodopa more potent. Anticholinergic-type drugs may be used to reduce tremors. Close medical supervision is required.

### SURGICAL TREATMENT

Various surgical procedures have been used to destroy tissue deep in the brain in an effort to decrease tremor. This is now made possible by computer-assisted technology. More research is being done for controlling or reversing the progressive pattern of this disease.



## INFECTIONS

Infections can attack the central nervous system in several ways. Invasion occurs directly by a virus or bacteria, and indirectly when a condition such as an ear infection or measles, leads to a major infection of the nervous system. Bacterial toxins or certain tick bites can also cause infection. The seriousness of the infections vary from being extremely ill for a few days to many months, and can result in permanent impairment or death.

### ■ EPIDURAL ABSCESS

This is caused by a bacterial infection that causes pus to form between the outer brain membrane and the bone of the spine or skull. Sometimes it invades the bone surface. It usually begins with an infection in the sinuses, ears, or the mastoid bone behind the ears. This is a very rare infection that is stabilized with antibiotics in an early stage. Serious neurological damage and death can occur if the abscess is not treated promptly.

#### SIGNS AND SYMPTOMS

Ear and nose pain with pus discharge; unrelenting headache; fever; nausea and vomiting; back pain and tenderness.

#### DRUG TREATMENT

Intravenous antibiotic therapy is used.

#### SURGICAL TREATMENT

If the antibiotic therapy is not successful, surgery may be necessary to drain the abscess or remove the inflamed mass.

### ■ ENCEPHALITIS

This is a rare and acute inflammatory disease of the brain caused by a viral infection. It may be due to direct viral invasion of the brain. Its most common form is secondary (post infectious) encephalitis, which follows or occurs with a viral infection in some other part of the body (eg, measles, chickenpox, rubella or mumps). The cause may be due to a reaction or a variety of viruses.

#### SIGNS AND SYMPTOMS

Confusion; drowsiness; disorientation; sudden fever; severe headache; nausea and vomiting; tremor; occasionally, a stiff neck. In infants, bulging in the soft spot of the skull.

#### TREATMENT

Because viruses that cause encephalitis do not respond to antibiotics, the treatment is adequate rest, fluids, and nourishment.

Neurological rehabilitation may be necessary to help with physical and speech problems.

#### DRUG TREATMENT

Acyclovir, an antiviral agent, is used for herpes simplex encephalitis.

Anticonvulsant medication is sometimes needed.



## ■ MENINGITIS

Acute bacterial meningitis is an infection and inflammation of the central nervous system that attacks the membranes (meninges) and cerebrospinal fluid surrounding the brain and spinal cord. Bacteria enters the blood by infections in other parts of the body, such as an infected sinus, ear, nose, or tooth. Other causes of meningitis include epidural abscesses resulting from medical procedures or Lyme's disease. Alcoholism, diabetes mellitus, AIDS, and immunosuppressive drugs, used in transplants, make a person more vulnerable to infection. Meningitis is most dangerous in the very young and the elderly. Acute bacterial meningitis is a medical emergency. The longer the infection goes untreated, the greater the risk of permanent neurological damage, such as hearing loss, brain damage, retardation, loss of vision, and/or death.

<b>SIGNS AND SYMPTOMS</b>	Fever; severe headache; vomiting; confusion; drowsiness; stiff neck.
<b>DRUG TREATMENT</b>	The antibiotic drugs prescribed vary depending on the type of bacteria causing the infection.
<b>SURGICAL TREATMENT</b>	When an abscess is present in the mastoid bone or sinus, an incision and drainage may be necessary.

## ■ POLIOMYELITIS

This is also called infantile paralysis and is a result of a viral infection that enters the body through the mouth and invades the body through the throat and digestive system. The polio virus is contagious and is passed by direct contact with contaminated feces or saliva. The disease may present itself as a minor illness, (sore throat, upset stomach, and low grade fever), as a meningitis, or as paralytic polio myelitis. The paralytic form occurs when the virus goes from the bloodstream into the central nervous system and infects nerve cells of the brain stem or spinal cord that controls muscle activity.

<b>SIGNS AND SYMPTOMS</b>	Limb paralysis with the ability to feel still intact; fever and headache; stiff neck and back; muscle weakness; difficulty in swallowing. Weakness and paralysis with respiratory failure are emergency symptoms.
<b>PREVENTION</b>	The two forms of vaccine are the Salk vaccine, which is administered by injections, and the Sabin vaccine, which is administered orally. The Sabin vaccine is used more frequently in the United States for routine childhood immunization which has resulted in rare occurrences of the disease. Immunization is usually advised when traveling to a foreign country. Physical therapy, during the paralysis stage, helps to prevent muscular deterioration.
<b>TREATMENT</b>	Mild cases are treated with bed rest. Artificial respiration may be necessary if the respiratory muscles are paralyzed.
<b>SURGICAL TREATMENT</b>	A tracheotomy (a cut made into the windpipe through the neck) may be needed to assist in breathing.



## ■ REYE'S SYNDROME

Reye's syndrome is very rare. It is a serious disorder that follows a viral infection in children. The specific cause is unknown, although aspirin may trigger the onset. It affects the blood, liver, and brain. Hospitalization in an intensive care unit is usually necessary.

### SIGNS AND SYMPTOMS

Persistent nausea and vomiting after a viral infection; drowsiness; stupor; loss of consciousness. Seizures and convulsions are emergencies.

### TREATMENT

Prevention can be accomplished by avoiding aspirin for fevers in children. Use safer alternatives such as acetaminophen or ibuprofen.

### DRUG TREATMENT

The chemical imbalances are treated with glucose and electrolyte solutions containing sodium, potassium, and chloride and involves the use of catheters to monitor the blood acid. A tube may be placed into the trachea to help in breathing.

## ■ AIDS AND THE NERVOUS SYSTEM

Acquired immune deficiency syndrome (AIDS) may lead to various nervous system diseases (see Infections chapter, AIDS section). Approximately one-third of persons with AIDS develop nervous system infections that result in meningitis, encephalitis, or myelitis. A paracystic cyst can also develop in the brain and cause progressive dementia.



## STRUCTURAL PROBLEMS OR TRAUMA

The nerve tissue in the brain is delicate and easily torn, bruised, or damaged by pressure. The brain and nerves are protected by bone and membranes. During an automobile, sport, or industrial accident, the skull and membranes may not be strong enough to escape the trauma. Structural damage to the brain from an accident can range from a mild concussion to permanent disability or death.

### ■ BELL'S PALSY

This is a paralysis of the muscles that control one side of the face. It results from damage to the facial nerve that runs beneath the ear to the muscles of the face on the same side. The cause is unknown, and the development is not well understood. One theory is the facial nerve becomes swollen and injured, perhaps by a viral infection. The changes may be temporary or permanent.

#### SIGNS AND SYMPTOMS

Sagging muscles and weakness on one side of the face; inability to close one eye.

#### TREATMENT

Some physicians believe the disorder will resolve without treatment. A patch over the affected eye protects the eyeball. Physical therapy and facial massage may help prevent long term symptoms.

#### DRUG TREATMENT

Corticosteroid drugs may reduce the swelling around the nerve and hasten recovery.

### ■ BRAIN TUMOR

A tumor is any mass or growth of abnormal cells (see Cancer chapter). It can be benign (noncancerous) or malignant (cancerous). The growth of benign tumors, however, are a threat because of the limited space inside of the skull. Primary brain tumors develop directly in the brain. Their cause is unknown and occasionally they are congenital or hereditary. Secondary (metastatic) tumors originate elsewhere in the body and spread to the brain. They are more common than primary tumors. Depending on the location of the tumor, different types of symptoms occur. There may be no symptoms or they may be rapidly progressive. If the tumor has spread, the primary concern is to provide comfort and preserve the neurological functions.

#### SIGNS AND SYMPTOMS

Headaches; vomiting; weakness and lethargy; personality change; double vision; incoordination or clumsiness of the arms or legs; intellectual deterioration.

#### DRUG TREATMENT

Corticosteroid drugs can be used to reduce swelling. Therapy may include radiation or anticancer drugs (chemotherapy) to kill the cells and prevent the tumor from growing.

#### SURGICAL TREATMENT

Surgical removal of a tumor is sometimes possible if it is not a threat to surrounding tissues. Advances in stereotactic surgery (combining the precision of surgery with the power of radiation therapy) make it possible to remove and/or treat some tumors deep within the brain.



## ■ CONCUSSION

A concussion is a violent jarring or shaking injury to the brain. This creates a sudden connection of the brain with the skull. With a mild concussion, there might be a brief time of unconsciousness. The more severe type has a lengthier time of unconsciousness and may result in the obstruction of vital functions. No structural damage to the brain is often evident with a concussion, although there may be cuts or bruises on the skin outside of the skull. Most often, the injuries occur from sports, recreational activity, automobile accidents, and industrial accidents. Fatality rates have been reduced with the use of cycling and sports helmets, hard hats, and seat belts. Avoid taking aspirin for this condition.

### SIGNS AND SYMPTOMS

Brief loss of consciousness or memory after a head injury; headache; faintness; nausea and vomiting; slightly blurred vision; difficulty in concentrating.

### TREATMENT

This is usually self-healing. Rest and relaxation, with no activities requiring concentration or physical activity, will result in recovery in a variable time period.

## ■ HYDROCEPHALUS

Hydrocephalus is a disorder where an abnormal amount of spinal fluid causes widening of the brain ventricles (chambers). The normal flow of spinal fluid can be altered by an increased release of fluid, a blockage in the brain ventricles, or a defect in the reabsorption of the fluid. These may result from growth disorders, infections, traumas, or brain tumors. It may be an immediate onset of symptoms or it may progress slowly with no symptoms until late childhood or even early adulthood. The pressure expands the sutures of the skull so that in a newborn or young child, the head is abnormally large, especially in the frontal area.

### SIGNS AND SYMPTOMS

Abnormal enlargement of the head in newborns; mental decline; slow and restricted eye movements. Loss of muscle coordination; urinary incontinence occur in older children and adults.

### TREATMENT

Repeated lumbar punctures (draining fluid from the spine) may be used to decrease the pressure.

### SURGICAL TREATMENT

A shunt (tube) is inserted to reroute the excess spinal fluid into the bloodstream or abdominal cavity, where it is reabsorbed. A shunt procedure normally may allow an infant's head size to become more normal and will relieve the symptoms. As the child grows, the shunt requires replacement and most often is left in for life.



## ■ NEUROBLASTOMA

A neuroblastoma is a cancerous tumor that occurs mainly in infants and children. It may develop in any part of the nervous system, but 70 percent of these tumors begin in the abdomen around the adrenal glands. The disease can spread early and quickly to various parts of the body, including the liver, lymph nodes, lung, bone marrow, and bones. Early treatment is often successful.

**SIGNS AND SYMPTOMS** Pallor; hypertension; diarrhea; abdominal mass; liver enlargement; bone pain; breathing difficulties; anemia.

**DRUG AND** If the tumor is small and has not spread, surgery alone or with local

**SURGICAL TREATMENT** radiation therapy may offer a cure. In a more advanced disease, chemotherapy may be successful. With the most advanced disease, the long term survival is less than 10 percent. A bone marrow transplant in these children may achieve a 25 percent survival rate.

## SEIZURES AND TICS

During normal working and sleeping, the brain cells produce various electrical patterns that can be recorded and identified with an electroencephalogram (EEG). If the electrical discharges in the brain become disorganized, a convulsion or seizure occurs. Seizures have many causes, and a single episode does not always mean there is a seizure disorder. Nervous tension and pain can cause habitual movements known as tics, which are not seizures.

## ■ FEBRILE SEIZURES

This is a type of seizure that occurs during a high fever. It is usually seen in children between three months and five years of age. A brief loss of consciousness and convulsion occur during a febrile (fevered) illness. This is a medical emergency, as it may be due to a serious infection, such as meningitis. Febrile seizure is not a chronic (long term) condition. It happens suddenly and only when a child has a high fever.

**TREATMENT** Lay the child on the floor and remove any objects nearby that could cause injury. Roll the child onto his or her side to make sure the tongue does not block breathing, and then call a physician.

**DRUG TREATMENT** If a child has at least two episodes, anticonvulsive medication may be required. If no seizures occur over a two year period, and the results of an EEG is negative, the medication may be discontinued.



## ■ GRAND MAL SEIZURES

These are generalized or total seizures due to abnormal electrical activity throughout the brain. In most cases, the seizures occur erratically but some are brought on during menstruation or result from a reaction to certain stimuli by light, touch, or reading. Sometimes the seizures will involve only a few muscles (focal seizures).

### SIGNS AND SYMPTOMS

Loss of consciousness with convulsions.

### DRUG TREATMENT

Medication controls or reduces seizures for more than 75 percent of affected individuals. If the seizures are due to an underlying medical condition, (eg, an endocrine disorder), medication for that condition is prescribed.

### SURGICAL TREATMENT

Surgery may be considered to stop the convulsions if they are caused by tumors, abscesses, or hemorrhage.

## ■ PETIT MAL SEIZURES (COMPLEX PARTIAL SEIZURES)

Petit mal seizures last only seconds or minutes, but up to a hundred episodes may occur in one day. In typical seizures, there may be no movement at all, fluttering eyelids, or a twitching hand during the brief lapse of consciousness. Full recovery only takes a few seconds, and afterward there may be no confusion and often, no memory of the incident.

### SIGNS AND SYMPTOMS

Brief, sudden absence of conscious activity; decline in a child's learning ability.

### TREATMENT

Most children with typical petit mal seizures can live normal lives. A physician will provide guidelines for activities and restrictions.



## HEADACHES

It is a very rare person who has never experienced a headache. Almost everyone experiences one at some time or another. Headaches have many causes, and the site, severity, and frequency vary. When a headache persists, worsens, or is not relieved by over the counter medications, testing may be necessary to diagnose the cause.

There are some recurrent types of headaches caused by conditions such as sinus infections, tension, premenstrual tension, or other underlying diseases. Fatigue, stress, or overuse of alcohol, drugs, or tobacco may precipitate a headache — or make it worse. Regardless of the type of headache you suffer from, you are the only one who recognizes what might bring them on. Do everything within your control to prevent them.

### ■ CLUSTER HEADACHES

Cluster headaches are characterized by an intense, burning, boring pain — frequently in or around one eye and temple and occasionally in one cheek or jaw. The affected eye is often blood shot and teary. Other symptoms are reduced pupil size on the affected side, a drooping eyelid, and a flushed face. The pain intensifies within five to ten minutes to a peak that usually persists for 30 minutes to two hours. Unlike migraine headaches, men are most susceptible. Unfortunately, cluster headaches do tend to come back, even after a long remission period. The cause is unknown but may be hormonal or genetic. Cluster headaches can be triggered by alcohol consumption. They are chronic and may be a lifelong disorder. The pain during an attack can be debilitating, but there is no permanent harm and the condition does not lead to other disorders. These headaches are frustrating as they do not respond to analgesics.

**TREATMENT** Inhalation of 100 percent oxygen may help at the time of the headache.

**DRUG TREATMENT** Ergotamine tartrate in suppository or aerosol form is an effective pain reliever.

Methysergide maleate, which acts to relieve and prevent attacks, is used during periods of pain and is tapered off during remission.

Lithium carbonate (used for bipolar depression) can be effective during a chronic phase. The dosage is then tapered to avoid side effects.

Calcium channel blocking agents, such as verapamil, are effective for preventing cluster headaches.

(These headaches may require two or more medications).



## ■ MIGRAINE HEADACHES

Migraine headaches are also known as vascular headaches. The cause is unknown but thought to be a problem with the blood vessels of the head. The headache will often begin in the morning, usually on one side of the head and then spread. It intensifies in about two hours and usually lasts for two days if not treated. The symptoms preceding the headache are referred to as the aura. One type of migraine is associated with an aura (classic migraine); the other type is without an aura (common migraine).

### SIGNS AND SYMPTOMS

**Classic migraine** is preceded by warning symptoms. Hours before there may be a feeling of elation, energy, thirst, hunger for sweets, drowsiness, irritability, or depression. About 20 minutes before the headache, neurological symptoms often appear that include sparkling flashes of light, zigzag lines, reading blind spots, dizziness, or a feeling of numbness on one side of the body.

**Common migraine** has no warning symptoms. The headache usually builds to intensity over several minutes or longer.

**Complicated migraine** has extended neurological symptoms prior to the painful headache.

**Familial hemiplegia** is associated paralysis on one side.

**Ophthalmoplegic migraine** is associated with partial eye paralysis.

**Status migrainous** persists for more than 72 hours.

**Migrainous infarction** has one or more aura symptoms that last for more than 21 days.

The biological cause of migraine headaches is unknown but tends to run in families. The diagnosis is established by the symptoms and the exclusion of other causes. Migraine is a chronic disorder without cure. The headaches are not life threatening and there is no evidence that the headache leads to other illnesses. Try to identify what triggers a migraine by keeping a diary. Women with migraines may suffer more when using estrogen (contraceptives, hormonal replacement). Keep predictable hours and do not “sleep in” on nonworking days.

### DRUG TREATMENT

Analgesics, such as aspirin, acetaminophen, ibuprofen and naproxen sodium, offer relief. Some combination analgesics with added caffeine and butalbital help some patients.

Antinauseants may be added to control vomiting.

Suppositories are available that help in some pain control.

Ergomine has been effectively used for the acute form but may cause symptoms of nausea, vomiting, cramps, and tingling sensation (peripheral vasoconstriction).

Imetrex (Cerenex), available by tablets, injection, and nasal spray is the newest effective treatment for migraine.



## ■ TENSION HEADACHES

A tension headache (also known as muscular contraction headache) is usually felt as an intense pain over the top of the head or back of the neck. It may feel like fullness or pressure. This is the most common head pain. Some are caused by poor posture, working in awkward positions, or a sudden strain. Stress, depression, and anxiety are the most common causes. These headaches can occur at any age, but chronic headaches usually develop in middle-aged people. Practical relaxation techniques, adequate rest, and exercise are important.

### DRUG TREATMENT

Aspirin, acetaminophen or ibuprofen are usually effective. Antidepressive drugs may be used for chronic problems. Avoid tranquilizers – they are not effective, and are addictive and expensive.



## SPINE AND PERIPHERAL NERVE DISORDERS

The peripheral nervous system runs from the brain and spinal cord to all other parts of the body and transmits information to and from the brain. It is the network of nerves that drive all movements and sensations. Damage to the spine or peripheral nerves interferes with the communication between the brain and the other areas of the body.

### ■ CERVICAL SPONDYLOSIS

Cervical spondylosis (cervical osteoarthritis) is the growth of bone spurs on the vertebrae in the neck. This happens slowly and the neck gradually stiffens. The bone spurs may eventually press against the peripheral nerves that may lead to pain in the shoulders and arms. A neck injury can start the process. It is most common in the elderly.

#### SIGNS AND SYMPTOMS

Pain and stiffness in the neck.

#### TREATMENT

The use of a neck collar or traction therapy at home is required for mild cases. Physical therapy and exercises may be used to relieve the symptoms in more severe cases.

#### DRUG TREATMENT

Muscle relaxants frequently give relief.

#### SURGICAL TREATMENT

Fusion (bringing together two bones of a joint) of the vertebrae and removal of the bone growth is often done but may reduce body movement.

### ■ CHARCOT-MARIE-TOOTH DISEASE

This is a relatively uncommon hereditary disorder caused by degeneration of the insulating sheath (myelin sheath) covering nerve fibers, or of the nerve fibers in the legs. Onset is usually between mid-childhood and 30 years of age. The disorder develops slowly and may quickly stabilize.

#### SIGNS AND SYMPTOMS

Weakness in legs; absence of stretch reflex; foot deformity.

#### TREATMENT

Vocational counseling, leg braces, and corrective shoes.

#### SURGICAL TREATMENT

Surgery may be done to correct deformities.



## ■ GUILLEIN-BARRE SYNDROME

This is a rare but serious neurological condition. The illness results from inflammation and destruction of the myelin sheath that covers the nerve cells. The cause is unknown, but in two out of three cases, it occurs after a viral infection. The condition is also seen in patients with Hodgkin's disease (a malignant disease of the blood). About five to ten percent occur after a surgical procedure. The disease starts with spreading numbness and tingling in the fingers or toes and muscle weakness. The symptoms can appear a few days to a week or two after the infection or in one to four weeks after an operation. There are about 3,500 cases per year in the United States and it occurs at any age. Most cases recover in a few months. If severely affected, long-term rehabilitation will be required. Some permanent impairment occurs in 10 percent of cases.

### SIGNS AND SYMPTOMS

Sensation of weakness normally spreads from the legs to the arms and face. In severe cases, weakness can paralyze the respiratory muscles and facial muscles resulting in difficulty with speech, chewing, and swallowing.

### TREATMENT

Supportive care.

### DRUG TREATMENT

Plasmapheresis is used in severe cases to reduce or eliminate antibodies from the serum. Once the treatment is stabilized, rehabilitation begins.

## ■ MYELOMENINGOCELE

This is a congenital defect that can leave a newborn baby's spinal cord open along several vertebrae in the lower or middle back. The spinal cord and membranes protrude shortly after birth. Neurological impairment below the defect, often including partial or complete paralysis, is common. Other congenital anomalies are associated with myelomeningocele, such as syringomyelia, clubfoot, or hip dislocation. Meningitis may occur from the open spinal canal.

### SURGICAL TREATMENT

Closing the defect is urgent. (This does not reverse the neurological defects, such as loss of bladder control.) With immediate surgical correction, a long life is possible, although impaired bladder and bowel function may continue.



## ■ NEURALGIAS

Neuralgias consist of severe spasms of pain that extend along the path of one of the nerves. They may be due to injury or irritation of the nerve, but in many cases the cause is unknown. The symptoms are often an attack(s) of extremely sharp, stabbing pain, or constant burning sensations. The patterns may be episodic attacks that last for seconds or minutes to recurrences of days or weeks. During an acute stage, a sensitivity to touch may be painful and some patients even perceive nonpainful sensations as painful. Some neuralgias occur as a result of a herpes zoster virus. Neuralgias usually strike after age 40 and occur most commonly in elderly persons.

### SIGNS AND SYMPTOMS

**Glossopharyngeal neuralgia** are recurrent attacks of severe pain in the back of the throat.

**Occipital neuralgia** is pain in the back of the head.

**Trigeminal neuralgia** is pain on the side of the face.

### TREATMENT

Physical therapy may be useful in some neuralgias.

### DRUG TREATMENT

Analgesics for pain relief.

Narcotic medication may be temporarily necessary.

Carbamazepine is helpful for trigeminal neuralgia.

Antidepressants may be prescribed to enhance the effect of the analgesics.

## ■ PERIPHERAL NEUROPATHIES

The peripheral nervous system is the network of nerves used for all body movements (motor nerves) and sensations (sensory nerves). Damage to a peripheral nerve can interfere with communication between the area it serves and the brain. Peripheral neuropathy is a term used to describe damage to the peripheral nerves that do not affect the brain and spinal cord. The causes are numerous, including injury, continuing pressure on a nerve, and nerve destruction from a disease or poisoning. The most common causes of peripheral neuropathies are diabetes mellitus, vitamin deficiency, alcoholism with poor nutrition, and inherited disorders.

### SIGNS AND SYMPTOMS

Tingling sensation with numbness, or pain in the hands or feet; unsteadiness or lack of coordination; weakness.

### TREATMENT

Treating the underlying cause of the peripheral neuropathy (eg, diabetes or B12 deficiency) is the first step. If the neuropathy is not responsive to medical management, mechanical devices may be used to help in mobilization.



## ■ SPINAL CORD TRAUMA

Most traumas to the spinal cord are from automobile accidents, falls, industrial accidents, sports injuries, and gunshot wounds. Various parts of the body can be affected, depending on the “level” of injury. The injuries occur most often in the neck (quadriplegia) or lumbar spine (paraplegia). Both affect bladder control. Urgent medical attention is required to control long term effects of the trauma. The immediate effect of a spinal cord injury is often paralysis or loss of sensation in part of the body. It can be fatal when the neck is injured. If recovery begins within the first week, the eventual recovery may be positive. If the bladder remains paralyzed, it may result in chronic urinary tract infections. Hospitalization is necessary.

### DRUG TREATMENT

Corticosteroids are given to help reduce swelling that may compress the spinal cord.

Antibiotics may be given for urinary tract infections.

### SURGICAL TREATMENT

Surgical procedures may be necessary to remove fragments of bone or foreign objects, repair fractured vertebrae, or decompress the spinal cord to reduce swelling. Traction is helpful in reducing some dislocations.

After healing, prolonged chemotherapy may be necessary to restore muscle wasting and atrophy (death of tissue).

## ■ SPINAL TUMOR

Spinal tumors are abnormal growths that occur within the spinal cord. Forty percent of spinal tumors are cancerous, although nonmalignant (benign) tumors take up space, pressure nerves, and cause damage. Occasionally, tumors start in another part of the body (lung or breast) and move into the bloodstream to the spine. Symptoms develop when the tumor presses against the spinal cord. Early diagnosis and treatment provide the best opportunity for curing the disease.

### SIGNS AND SYMPTOMS

Steadily increasing back pain; numbness or cold sensations; muscle weakness in one or more limbs.

### DRUG TREATMENT

Corticosteroids are used to reduce swelling.

### SURGICAL TREATMENT

Surgical removal is usually done for a tumor that is isolated outside the spinal cord. Other tumors may not be completely removable, and radiation therapy may be needed. Physical therapy after treatment is often necessary.



## ■ SYRINGOMYELIA

Syringomyelia is a fluid-filled cavity that grows within the spinal cord, usually in the neck. The cavity may expand across or along the spinal cord and reduce the sense of pain and temperature, and cause wasting of the muscles. Syringomyelia occurs in adolescence or early adulthood and can be caused by a spinal cord trauma, tumor, or a congenital defect.

### SIGNS AND SYMPTOMS



The progression of symptoms are very slow – gradual loss of sensation in the nape of the neck, shoulders, and upper arms; weakness of the arms or legs; gradual disability.

### SURGICAL TREATMENT

Surgical treatment is done to drain fluid from the cavity and decompress the spinal cord. Approximately one-half of people with this disorder improve after surgery.



## WHAT TO DO

SEVERITY LEVEL	SYMPTOM	POSSIBLE DIAGNOSIS
 <p><b>Seek Medical Help Immediately!</b></p>	<p><i>In some of these conditions, after a diagnosis has been made by a physician, self management and/or behavior may help with symptoms. This kind of management should only be recommended by a physician.</i></p>	
	<p>Steady or fluctuating headache, drowsiness, seizures or confusion after a head injury, partial paralysis on one side of the body, change in personality</p>	Subdural hemorrhage
	<p>Sudden weakness, numbness or paralysis of face, arm or leg, sudden dimness or loss of vision, loss of speech, severe headache, dizziness, unsteadiness or sudden falls</p>	Stroke
	<p>Headache, drowsiness, nausea, vomiting, dizziness, dilated pupils, confusion after a head injury. In emergency cases, sudden onset of weakness, ringing or numbness on one side, double or or lost vision, speech difficulty, vertigo</p>	Transient ischemic attach (TIA)
	<p>Loss of consciousness with convulsions</p>	Grand mal seizures
	<p>Sensation of weakness spreading from legs to arms and face. In severe cases, weakness can paralyze the respiratory muscles and facial muscles</p>	Guillain-Barre syndrome
 <p><b>Make an appointment to see your doctor</b></p>	<p><b>DEGENERATIVE DISORDERS</b></p>	
	<p>Gradual loss of memory, inability to learn new things, repeating oneself, misplace objects, confusion, disintegration of personality and judgment, anxiety, depression</p>	Alzheimer's disease
	<p>Gradual loss of strength and coordination in limb(s), muscle twitches or cramps, clumsy gaits</p>	Amytrophic lateral sclerosis (ALS)
	<p>Full or partial spastic paralysis or weakness in limb(s), tremor, vision, speech, or hearing disorders, mental retardation</p>	Cerebral palsy



Make an appointment to see your doctor

Rhythmic, alternating movement of hands, arms, head, tongue, or larynx  
Wide, prancing gait, hesitant speech, involuntary jerky movement, personality changes

Huntington's chorea

Gradual loss of memory, disintegration of personality, depression, sudden laughing and crying, partial paralysis of one side of the body

Multi-infarct dementia

Numbness, weakness, or paralysis in limb(s), impaired vision with pain during eye movement, tremor, lack of coordination, unsteady gait, rapid, involuntary eye movement

Multiple sclerosis (MS)

Shaking at rest (tremor), reduced facial expression, slow movement, rigidity in limbs, monotone voice, difficulty with balance, speech, swallowing, and chewing

Parkinson's disease

#### INFECTIONS

Ear and nose pain with discharge, headache, fever, nausea, vomiting, back pain

Epidural abscess

Confusion, drowsiness, disorientation, fever, headache, nausea, tremor. In infants, bulging soft spot of the skull

Encephalitis

Fever, severe headache, vomiting, confusion, drowsiness, stiff neck

Meningitis

Persistent nausea and vomiting, after a viral infection, drowsiness, stupor, loss of consciousness. Seizures and convulsions are emergencies

Reye's syndrome

#### STRUCTURAL PROBLEM OR TRAUMAS

Sagging muscles and weakness on one side of face, inability to close one eye

Bell's palsy

Brief loss of consciousness or memory after head injury, headache, faintness, nausea and vomiting, slightly blurred vision, difficulty concentrating

Concussion



Make an appointment to see your doctor

Abnormal enlargement of head in newborn; mental decline, slow and restricted eye movement, loss of muscle coordination, urinary incontinence in older children and adults

Hydrocephalus

Headaches, vomiting, weakness and lethargy, personality change, double vision, incoordination, intellectual deterioration

Brain tumor

Pallor, hypertension, diarrhea, abdominal mass, bone pain, breathing difficulties, anemia

Neuroblastoma

Pain over top of head or back of neck, with feeling of pressure

Tension headache

Spreading headache that intensifies in time, often lasts up to two or three days

Migraine headache

### SEIZURES AND TICS

Loss of consciousness with convulsions

Grand mal seizures

Sudden and brief absence of conscious activity, decline in a child's learning ability

Petit mal seizures

### SPINE AND PERIPHERAL NERVES

Pain and stiffness in neck

Cervical spondylosis

Weakness in legs, absence of stretch reflex, foot deformity

Charcot-Marie-Tooth disease

Sensation of weakness spreading from legs to arms and face. In severe cases, weakness can paralyze the respiratory muscles and facial muscles

Guillain-Barre syndrome

Tingling sensation with numbness, pain in hands or feet, unsteadiness, weakness

Peripheral neuropathies

Steadily increasing back pain, numbness or cold sensations, muscle weakness in limb(s)

Spinal tumor

Gradual loss of sensation in nape of the neck, shoulders and upper arms, weakness of arms or legs with gradual disability

Syringomyelia