COMMON NEUROLOGICAL DISEASES

Alzheimer's disease

Is the most common cause of dementia. Because its frequency increases with age, the number of people it strikes is growing as the population ages. In addition to memory loss, the first signs of Alzheimer's often include language difficulties and trouble with routine activities, such as driving and shopping. Mood changes may also occur. As the disease progresses, long-term memory may also be affected, and behavioral changes such as aggression, agitation, delusions and verbal outbursts may occur. The ability to carry out daily tasks, such as dressing or bathing, may be compromised. In severe Alzheimer's, the abilities to talk and walk may be lost.

Dementia and Alzheimer's

Dementia is the loss of ability to think due to the impairment of memory. Generally used to describe an abnormal part of the ageing process. There are many different types of dementia, and many different causes.

Causes

Alzheimer's is a neurodegenerative disease, which means neurons (brain cells) progressively degenerate, eventually losing function and dying. Cells in the hippocampus, a seahorse-shaped structure deep in the brain that plays a major role in the formation of memories, appear to be especially vulnerable. In brain-imaging studies of people with Alzheimer's, the hippocampus is consistently smaller than normal. Accumulation of beta amyloid in nerve cells, in between the nerve cells and in the small blood vessels, together with vascular changes and possibly inflammation, are features of AD. There may be an inherited predisposition, but no specific cause has been identified in AD. The symptoms start insidiously and progress steadily over 10-20 years.

The brain pathways that link the hippocampus to other brain regions are also damaged, especially for those that lead to the prefrontal cortex, the brain's control centre for cognitive functions. Many scientists believe that this damage may be responsible for the persistent short-term memory problems that appear in the early stages of the disease.

Common Symptoms

Each person with Alzheimer's may experience different symptoms, and symptoms may change over the course of the disease. Some of the common ones are described below.

- Difficulty in recalling names, objects, places, times and dates
- Not recognizing family members and friends, or not recalling their names

- Forgetting one's own phone number or address
- Difficulty finding their way to or from a familiar place
- Tendency to wander from home or office
- Day/night disorientation with difficulty sleeping
- Noticeable language and intellectual decline
- Poor judgment, inability to follow simple instructions or stay focused on a task
- Progressive sense of distrust
- Dulled emotions or interest in activities
- Depression
- Unusual agitation and irritability
- Hallucinations or delusions

Diagnosis

The earliest signs of Alzheimer's disease are usually first noticed by a friend or relative. If you or someone close to you is experiencing any of the symptoms listed in "Common Symptoms of Alzheimer's Disease", it is important to see a doctor as early as possible to determine the cause. Memory loss could be the result of a number of things, many of which may be reversible.

Currently, the only definitive diagnosis for Alzheimer's disease is based on an examination of brain tissue during autopsy. To establish a clinical diagnosis, doctors focus on ruling out, by process of elimination, all other possible causes of symptoms to determine whether AD might be the cause.

The evaluations your doctor should perform include:

- Medical history – current medical or psychological conditions, including a thorough review of personal and family health history and medications being used
- Neurological examination - assesses one's sense of time and place, ability to remember, understand and communicate, and complete simple calculations
- Physical examination - evaluation of nutritional status, blood pressure, and pulse rate

If these initial examinations don't reveal a clear problem, additional tests might include:

- Brain imaging scans, such as MRI or CT, to look for tell-tale brain changes
- Laboratory tests, including blood and urine tests to try to identify blood-based or hormonal irregularities
- More extensive neuropsychological evaluations, which might include tests of memory, reasoning, vision-motor co-ordination, and language function
- Psychiatric evaluations, to assess mood and other emotional factors.

A diagnosis of Alzheimer's disease is usually said to be either:

Probable: All other disorders that may cause dementia have been ruled out; or
Possible: AD is suspected, but other causes cannot be ruled out

Treatment

As science progresses toward a better understanding of what kills brain cells in Alzheimer's disease, the hope is that medicines or other therapies might be developed to delay, prevent or reverse the damage. Clinical trials are underway for drugs, as well as a vaccine, that seek to interrupt the build-up of amyloid in the brain. If they are found to be safe and effective, these would be the first treatments that address what many experts think is the underlying cause of cell death. Unfortunately, it could take years for these therapies to reach patients. In the meantime, the primary goals of therapy for AD are to improve the quality of life and day-to-day functioning.

Current treatments for Alzheimer's include three relatively new medications that increase brain levels of acetylcholine, a neurotransmitter involved in the learning and memory processes. These drugs - Aricept, Exelon and Reminyl - have been modestly successful in some patients for improving memory and attention skills, and they may also have a beneficial effect on behavioral symptoms such as aggression.

Treatments may also target behavioral symptoms associated with AD, such as agitation, delusions, hallucinations, depression, or sleep difficulties. Medications to control these problems might include anti-depressants (such as Prozac, Zoloft and others), or sleep aids (such as Zopiclone). Consistent medical and psychological therapy is important for the individual as well as for family members.

Living with Alzheimer's

When severe memory loss significantly interferes with daily life, simple tasks can be difficult or insurmountable. Below are some strategies recommended by experts that may help lessen the impact on day-to-day functioning.

- Establish and follow a regular routine in familiar surroundings
- Draw a map for simple routes; write down directions
- Make lists, and use a calendar or pocket diary to jot down reminders and keep track of important dates and financial matters
- Recognize the limitations of what can be done and set realistic daily goals
- Keep track of when medicines are taken; use a reminder box or chart posted on the refrigerator to stay current with prescriptions
- Get regular medical check-ups and tell the doctor about any medicine being taken or changes in health status
- Stay in touch with family, friends and acquaintances.
- Get treatment for any other chronic health conditions, such as high blood pressure, diabetes, high cholesterol, or heart disease
- If agitation is a problem, find alternative ways to express anger, such as exercising, hitting a punching bag, or making a gripe list.

Migraine

The pain of a migraine headache is often described as an intense pulsing or throbbing pain in one area of the head. It is often accompanied by extreme sensitivity to light and sound, nausea, and vomiting. Migraine is three times more common in women than in men. Some individuals can predict the onset of a migraine because it is preceded by an *"aura,"* visual disturbances that appear as flashing lights, zig-zag lines or a temporary loss of vision.

People with migraine tend to have recurring attacks triggered by a number of different factors, including bright or flashing lights, lack of food or sleep, or exposure to light. Migraine in women often relates to changes in hormones and hormonal levels. Anxiety, stress, or relaxation after stress can also be triggers. For many years, scientists believed that migraines were linked to the dilation and constriction of blood vessels in the head. Investigators now believe that migraine is caused by inherited abnormalities in genes that control the activities of certain cell populations in the brain.

Is there any treatment for migraine?

There are two ways to approach the treatment of migraine headache with drugs: prevent the attacks, or relieve the symptoms during the attacks. Everyone with migraine needs effective treatment at the time of the headaches. Many people with migraine use both approaches by taking medications originally developed for epilepsy, depression, or high blood pressure to prevent future attacks, and treating attacks when they happen with drugs called trip tans that relieve pain and restore function. Hormone therapy may help some women whose migraines seem to be linked to their menstrual cycle. Stress management strategies, such as exercise, relaxation, biofeedback, and other therapies designed to help limit discomfort, may also reduce the occurrence and severity of migraine attacks. Lifestyle changes that can reduce or prevent migraine in some individuals includes avoiding food and beverages that trigger headaches, eating regularly scheduled meals with adequate hydration, stopping certain medications, and establishing a consistent sleep schedule. A weight loss program is recommended for obese individuals with migraine.

What is the prognosis for migraine?

Taking a combination of drugs to prevent and treat migraine attacks when they happen helps most people with migraine to limit the disabling effects of these headaches. Women whose migraine attacks occur in association with their menstrual cycle are likely to have fewer attacks and milder symptoms after menopause.

What research is being done?

Researchers believe that migraine is the result of fundamental neurological abnormalities caused by genetic mutations at work in the brain. Investigations of the more rare, familial subtypes of migraine are yielding information about specific genes and what they do, or don't do, to cause the pain of migraine headache. Understanding the cascade of biological events that happen in the brain to cause a migraine, and the mechanisms that underlie

these events, will give researchers opportunities to develop and test drugs that could prevent or interrupt a migraine attack.

Parkinson's Disease

Parkinson's disease (PD) belongs to a group of conditions called motor system disorders, which are the result of the loss of dopamine-producing brain cells. The four primary symptoms of PD are tremor, or trembling in hands, arms, legs, jaw, and face; rigidity, or stiffness of the limbs and trunk; bradykinesia, or slowness of movement; and postural instability, or impaired balance and coordination. As these symptoms become more pronounced, patients may have difficulty walking, talking, or completing other simple tasks. PD usually affects people over the age of 50.

Early symptoms of PD are subtle and occur gradually. In some people the disease progresses more quickly than in others. As the disease progresses, the shaking, or tremor, which affects the majority of PD patients may begin to interfere with daily activities. Other symptoms may include depression and other emotional changes; difficulty in swallowing, chewing, and speaking; urinary problems or constipation; skin problems; and sleep disruptions.

There are currently no blood or laboratory tests that have been proven to help in diagnosing sporadic PD. Therefore the diagnosis is based on medical history and a neurological examination. The disease can be difficult to diagnose accurately. Doctors may sometimes request brain scans or laboratory tests in order to rule out other diseases.

Is there any treatment for Parkinson's?

At present, there is no cure for PD, but a variety of medications provide dramatic relief from the symptoms. Usually, patients are given levodopa combined with carbidopa. Carbidopa delays the conversion of levodopa into dopamine until it reaches the brain. Nerve cells can use levodopa to make dopamine and replenish the brain's dwindling supply. Although levodopa helps at least three-quarters of parkinsonian cases, not all symptoms respond equally to the drug. Bradykinesia and rigidity respond best, while tremor may be only marginally reduced. Problems with balance and other symptoms may not be alleviated at all. Anticholinergics may help control tremor and rigidity. Other drugs, such as bromocriptine, pramipexole, and ropinirole, mimic the role of dopamine in the brain, causing the neurons to react as they would to dopamine. An antiviral drug, amantadine, also appears to reduce symptoms PD or as a single-drug treatment for early PD.

In some cases, surgery may be appropriate if the disease doesn't respond to drugs. A therapy called deep brain stimulation (DBS) has now been approved by the U.S. Food and Drug Administration. In DBS, electrodes are implanted into the brain and connected to a small electrical device called a pulse generator that can be externally programmed. DBS can reduce the need for levodopa and related drugs, which in turn decreases the involuntary movements called dyskinesias that are a common side effect of levodopa. It also helps to alleviate fluctuations of symptoms and to reduce tremors, slowness of movements, and gait

problems. DBS requires careful programming of the stimulator device in order to work correctly.

What is the prognosis for Parkinson's?

PD is both chronic, meaning it persists over a long period of time, and progressive, meaning its symptoms grow worse over time. Although some people become severely disabled, others experience only minor motor disruptions. Tremor is the major symptom for some patients, while for others tremor is only a minor complaint and other symptoms are more troublesome. No one can predict which symptoms will affect an individual patient, and the intensity of the symptoms also varies from person to person.

Amyotrophic lateral sclerosis (ALS)

Amyotrophic lateral sclerosis (ALS), also referred to as Lou Gehrig's disease, is a progressive motor neuron disease affecting the nerve cells to motor neuron in the brain and spinal cord.run Motor neurons are small bundles of nerves that from the brain to the spinal cord, then from the spinal cord to the muscles throughout the body.

The progressive degeneration of the motor neurons causes them to die,a nd the brain loses the connection with the muscle. The result is a lack of muscle control. This "disconnection" then causes the muscle to lose neuron nourishment and stimulation, resulting in muscle atrophy (becoming smaller).

Causes

In about 10 cases, ALS is caused by an inherited genetic defect. In all other cases , the cause is unknown. ALS currently affects about five out of every 100,000 people worldwide.

There is no known risk factor for ALS, except for having a family member who has had the hereditary form of the disease. The biological mechanisms that cause ALS are only partially understood and may be due to a particular gene called SOD1. A mutation in this gene is thought to make a protein that is toxic to the motor nerve cells. Due to the accumulation of this toxin, people with ALS progressively lose the ability to function and care for themselves. They no longer have voluntary control over their muscles and eventually lose involuntary control that is required for vital organ systems.

Symptoms

The initial onset of ALS, symptoms may be so slight that they are frequently overlooked. Most symptoms develop later in adulthood, usually after age 50. However, they can occur in younger people. People who experience ALS have a loss of muscle strength and coordination that gradually gets worse. Muscle weakness may occur in hands, arms or legs or the muscles that control speech, swallowing and breathing. Often the early signs include twitching and muscle cramps, especially in the hands and feet. These signs can vary significantly from person to person. Symptoms often begin with tripping or falling spells. For others, symptoms begin with slurred speech or episodes of crying or laughing. Difficulty lifting items, buttoning clothes or walking are also common signs.

Muscle weakness is the hallmark sign in ALS, occurring in approximately 60 percent of patients. As the disease begins to worsen, it spreads to the trunk muscles of the body. This leads to dysfunction or weakening of speech, swallowing, chewing and breathing. When breathing muscles become affected, the patient will require permanent ventilator support to survive. These signs represent the end stage of the disease process.

Diagnosis

To date, there is no one test or procedure to ultimately diagnose ALS. It is through a physical examination and diagnostic testing, often to rule out other diseases that mimic ALS, that a diagnosis can be made.

The physical exam usually includes an extensive strength and endurance exam. This will assess the patient's degree of muscle weakness throughout the body. This may show weakness beginning in a particular area, muscle tremors, spasms, twitching or atrophy. A patient with ALS may even have an abnormal gait (or be stiff or have a clumsy walk). Reflexes are often abnormal in that they will be increased at the joint and reduced in the gag reflex. Some patients may have trouble controlling episodes of crying or laughing, often called *"emotional incontinence."*

Comprehensive diagnostic testing may be done at the discretion of the physician. These tests may include:

- Neurological examination
- Electromyography (EMG) & Nerve conduction velocity (NCV)
- Blood and urine studies
- Spinal tap
- X-rays, including magnetic resonance imaging (MRI)

- Myelogram of the cervical spine
- Muscle and/or nerve biopsy

Treatment

At this time, there is no treatment that will cure or slow down the progression of ALS. There are medications that will help with symptoms, along with palliative care to improve comfort.

Aneurysm

A brain aneurysm is a weak area in the wall of a blood vessel that bulges or balloons out. If the aneurysm grows to a certain size, it can burst, causing bleeding into the brain. This is called a *subarachnoid hemorrhage.* People are not born with brain aneurysms – they usually develop at some point in life.

Factors associated with increased risk for aneurysm formation or increased risk for bleeding from an aneurysm are smoking, high blood pressure and family history of brain aneurysms.

Aneurysms usually do not cause a problem until they rupture. Aneurysm bleeding always causes sudden onset of a horrible headache. If the bleeding is severe, there may also be loss of consciousness, lethargy and/or confusion. This is very serious and must be treated right away. If not treated, the chance of death is very likely.

Types of brain aneurysms

Ruptured aneurysm: There is a hole in the aneurysm wall from the initial bleed. The goal is to fix the aneurysm so it can't bleed again.

Unruptured aneurysm: If an aneurysm is thought to be at relatively high risk for hemorrhage in the future (aneurysms bigger than 6-7 mm in diameter, aneurysms in certain locations, aneurysms in smokers or in those with family history of aneurysms), it can be treated before it ruptures

Epilepsy

Epilepsy is a disorder marked by recurring seizures due to abnormal activity of nerve cells, called neurons, in the brain. In the United States, about 2 million people have this condition and as many as 150,000 more people develop epilepsy each year, about a third of them children.

Epilepsy may have many possible causes such as an imbalance of nerve-signaling chemicals called neurotransmitters or an attempt by the brain to repair itself after a head injury or stroke, which could inadvertently generate abnormal nerve connections. Other types of epilepsy run in families and have been tied to specific genes.

The diagnostic program includes magnetic resonance imaging (MRI) and positron emission tomography (PET), to provide images of the brain as well as electrical studies such as an electroencephalogram (EEG to record brain waves.

Treatments include medication, brain surgery, vagus nerve stimulation and experimental therapies that involve drugs, devices and surgery. Patients also have the opportunity to participate in studies, called clinical trials, to test the latest experimental treatments. Clinical trials make new drugs, therapies and surgical procedures available to patients before they're widely available to the general public.

Symptoms

Generalized seizures are caused by abnormal electrical impulses in the brain and typically occur with no warning. There are six types of generalized seizures.

- ***Tonic-clonic (grand-mal) Seizure*** - This seizure causes you to lose consciousness and often collapse. Your body becomes stiff during what's called the "tonic" phase. During the "clonic" phase, muscle contractions cause your body to jerk. Your jaws clamp shut and you may bite your tongue. Your bladder may contract and cause you to urinate. After one to two minutes, you fall into a deep sleep.
- ***Absence (petit mal) Seizure*** - During these brief episodes, you lose awareness and stare blankly. Usually, there are no other symptoms. They tend to begin and end suddenly and last for about five to 10 seconds, although they can last longer. These *seizures may occur several times a day.*
- ***Myoclonic Seizure*** - These very brief seizures cause your body to jerk, as if shocked by electricity, for a second or two. The jerks can range from a single muscle jerking to involvement of the entire body.
- ***Clonic Seizure*** - This seizure cause rhythmic jerking motions of the arms and legs, sometimes on both sides of your body.
- ***Tonic Seizure*** - Tonic seizures cause your muscles to suddenly stiffen, sometimes for as long as 20 seconds. If you're standing, you'll typically fall.
- ***Akinetic or Atonic Seizure*** - This seizure causes your muscles to relax or lose stength, particularly in the arms and legs. Although you usually remain conscious, it

can cause you to suddenly fall and lead to injuries. These seizures also are called "drop attacks."

Focal Seizures

Focal seizures, also known as local or partial seizures, are caused by abnormal electrical activity in a specific, smaller part of the brain. The part of the brain causing the seizure is called the seizure focus. Focal seizures are divided into simple and complex seizures.

Some focal seizures evolve into generalized ones and are called secondarily generalized seizures.

- ***Simple Focal Seizure*** - During these seizures, you remain conscious although some people can't speak or move until the seizure is over. Uncontrolled movements, such as jerking or stiffening, can occur throughout your body. You also may experience emotions such as fear or rage or even joy; or odd sensations, such as ringing sounds or strange smells. In addition, you may experience peculiar memories such as a feeling of "deja-vu." Typically, these seizures last less than one minute.
- ***Complex Focal Seizure*** - During these seizures, you are not fully conscious and may appear to be in a dreamlike state. Typically, they start with a blank stare. You may involuntarily chew, walk, fidget, or perform other repetitive movements or simple actions, but actions are typically unorganized or confused. These seizures typically last betwen 30 seconds and a minute.
- ***Secondarily Generalized Seizure*** - These seizures begin as a focal seizure and develop into generalized ones as the the electrical abnormality spreads throughout the brain. When the seizure begins, you may be fully conscious but then lose consciousness and experience convulsions as it develops.

Diagnosis

During your visit to the Epilepsy Center, we will record your medical history — as well as your family's medical history — and conduct diagnostic tests. Your neurologist will determine the type of seizures you're having and the cause. If you're diagnosed with epilepsy, your doctor will identify the specific type you have to determine the best treatment.

We will ask many questions about your seizures. If you lose consciousness during your seizures, please bring a family member or friend, who might help describe what happens during your seizures.

Some of the questions you can expect include:

- How old were you when your seizures began?
- What was happening around you when you had your first seizure?
- Does anything in particular trigger your seizures?
- What do you experience during your seizures?

- What do observers notice when you have your seizures?
- How long do the seizures last?
- How frequently do they occur?
- What treatments have you received for seizures and what were the results?

If your primary care doctor has sent your medical records, we will review this information.

Please tell your neurologist about any medications you are currently taking, including over-the-counter medications as well as vitamins, nutritional supplements or herbal remedies.

Your complete neurological examination may include tests such as:

- Blood or urine tests
- Electrocardiogram (ECG), which measures heart activity
- Electroencephalogram (EEG), which measures electrical activity in your brain
- Imaging tests such as computed tomography (CT) scans, magnetic resonance imaging (MRI) and X-rays.

Treatment

Your neurology team at the Epilepsy Center, along with your primary care doctor, will design a treatment plan tailored to your condition and individual needs. You may require more than one kind of treatment — such as medication and surgery — and may be referred to or other medical professionals.

Medication

Most seizures can be prevented with medication. The type of medication prescribed for you will depend on your condition. Your neurologist will explain how to take your medication and what side effects might occur. Over time, your medication may be changed to find the right drug and dose. Be sure to take your medication as directed. Call your neurologist if you have questions or have any unexpected side effects.

Surgery

For some patients, surgery may be recommended to prevent seizures or to implant devices that deliver medications or stimulators to emit electrical impulses. Your neurologist will explain the procedure as well as possible risks.

These procedures include:

- Disconnection Procedures, which disrupt abnormal electrical activity that occurs in the brain and triggers epileptic seizures. Two types of disconnection operations are:
    - Corpus callostomy, which stop atonic and tonic seizures.

- Multiple subpial transections, which are performed when seizures are caused by parts of the brain that can't be removed.

- Focal Resections — These procedures are the most common operations for treating epilepsy and provide the best chance for patients to gain complete seizure control. They involve the removal of a small area of the brain where seizures originate. New brain monitoring techniques allow doctors to better pinpoint brain tissue causing seizures. Types of resections include:
  - Temporal lobectomy, where a portion of the temporal lobe is removed to control seizures.
  - Lobar resection, where a portion of a seizure-producing lobe — frontal, parietal or occipital lobe — is removed, if it can be done without damaging vital functions.
  - Hemispherectomy, where one sphere of the brain is removed or disabled. The remaining half of the brain takes over many of the functions of the half that was removed. This procedure is used to treat severe conditions that have not responded to other treatments.

- Gamma Knife Radiosurgery — This procedure delivers a finely focused, high dose of radiation to remove tissue without damaging surrounding tissue. Some types of seizures, such as gelastic seizures which are accompanied by brief, sudden bursts of emotion, can be treated with this technology.

- Vagus nerve stimulation — This procedure involves minor surgery and is a relatively new treatment that helps prevent or lessen the severity of seizures. An electrical stimulator is implanted that sends regular electrical pulses through the vagus nerve to the brain to reduce the onset or frequency of seizes.

  If a seizure occurs between doses of current, a magnet can be passed over the device to trigger an additional dose. If you have a vagus nerve stimulator implanted, you'll continue to take medication but sometimes can reduce the amount or number of medications. This procedure can treat a wide variety of seizure disorders when other surgical procedures aren't an option.

Most medical treatments can involve some risks or complications. Your neurologist will explain any possible risks or complications from the treatments you'll receive. Don't be afraid to ask your doctors, nurses or therapists about your treatment. If your treatment includes medication, be sure to take it exactly as the doctor has ordered. And remember to keep all your follow-up appointments with our doctors and other medical staff.

Prevention and follow-up

To help cope with epilepsy and reduce your chance of injury from seizures, we recommend these guidelines:

- Carry identification, including a bracelet, card or necklace that shows you have epilepsy. In an emergency, this information can ensure that you receive the right care.
- Explain to your family, friends and co-workers how to care for you if you have a seizure.
- Follow your state regulations about driving motor vehicles.
- If you are having regular or even occasional seizures, avoid dangerous situations at work and during leisure activities. For example, do not work in high places, on ladders or scaffolding, or near sharp or moving objects. Be careful when you play sports. Don't swim or go mountain climbing by yourself.
- Don't stop taking your seizure medication or change the amount you take unless you discuss this with your doctor.
- Talk with your doctor or pharmacist before you take other medications in addition to your seizure drugs.

If you are pregnant or are thinking of becoming pregnant and you have been diagnosed with epilepsy, talk to your neurologist as soon as possible. You may need to take vitamin supplements to protect your baby.

Multiple Sclerosis

Multiple sclerosis (MS) is a chronic disease that affects the central nervous system, including the brain, spinal cord and optic nerves. Experts believe MS is an autoimmune disease caused by the immune system attacking and damaging the nervous system. It generally progresses gradually, with alternating periods of remission, good health and disabling flare-ups.

Although there is no cure, most MS patients lead active lives for many years after their diagnosis and have a normal life span. But MS can be tiring and require schedule and lifestyle adjustments. A regular exercise program that includes walking, swimming, stretching or riding a stationary bike can reduce some symptoms. Our physical therapists and staff can help you learn to cope with your condition by improving your walking ability, balance, range of motion and stamina.

Symptoms

The symptoms of multiple sclerosis depend on which particular pathway of nerve fiber is damaged. Tingling, numbness, sensations of tightness or weakness may result when myelin in the spinal cord is damaged. If nerve fibers to the bladder are affected, urinary incontinence may occur. Likewise, damage to the cerebellum portion of the brain may result in imbalance or a lack of coordination. MS patients can have a wide range of symptoms, depending on where the damage occurs in the central nervous system.

Because MS can cause a wide variety of symptoms in different people, doctors frequently struggle to diagnose the disease. However, common symptoms of MS include changes in sensation or sensory symptoms such as tingling and numbness, and changes in muscle function or motor symptoms such as difficulty walking, stiffness or tremors.

Some common symptoms are:

- Clumsiness or weakness
- Difficulty walking or maintaining balance
- Dizziness or vertigo
- Eye problems such as double vision or uncontrolled eye movements
- Fatigue
- Muscle spasms
- Problems with bladder or bowel control

- Stiffness
- Tremors
- Tingling or numbness
- Depression or emotional changes
- Mild intellectual change such as memory problems
- Sexual problems such as difficulty reaching orgasm, lack of vaginal sensation or erectile dysfunction

Symptoms usually appear in people between 20 and 40 years of age.

Diagnosis

When considering a diagnosis of multiple sclerosis, your doctor will be particularly interested in hearing about your symptoms, when they started and how they've eased or progressed over time.

Your diagnosis also will be based on a physical examination and tests. These tests may include:

- Blood and urine tests to help rule out other possible disorders
- Electrocardiogram (ECG or EKG) to measure electrical activity in the heart
- Magnetic resonance imaging (MRI) to look for abnormalities in the brain
- Lumbar puncture or spinal tap to determine if there are abnormalities in the cerebrospinal fluid, one of the signs of MS
- Evoked potentials test, which records electrical activity in the brain when nerves are stimulated

Medical conditions that can mimic MS include metabolic or vitamin deficiencies, unusual infections, inflammation of the blood vessels of the brain, degenerative disorders of the nervous system or cancers that have spread to the brain. This is why blood tests, X-rays, brain and spine MRIs, and spinal taps to analyze cerebrospinal fluid may be required before a diagnosis of MS can be made with certainty.

A diagnosis of MS is based upon an evaluation of your symptoms along with the results of your physical exam and tests.

Treatment

Your neurology team, along with your primary care physician, will design a treatment plan tailored to your medical condition, state of health and individual needs. You may need more than one kind of treatment, or a treatment requiring several visits to the Multiple Sclerosis Center. Also, you may be referred to other doctors or health professionals.

Doctors and researchers have identified four categories of treatment for patients with MS:

- Treatment that reduces the severity and duration of attacks
- Treatment to cure or eliminate the biological activity of MS in the body
- Treatment to relieve various symptoms such as incontinence, visual disturbances or fatigue
- Treatment that repairs damage caused by MS

Treatments may involve some risks or complications, which will be fully explained to you by your neurologist.

Treatments may include one of many medications such as:

- Beta interferon - A family of drugs that help fight viral infection and regulate your immune system
- Glatiramer acetate - A drug that doctors believe works by blocking your immune system's attack on myelin
- Immunosuppressive drugs - Drugs to suppress or control the immune system

Other medications may be prescribed to treat or control symptoms such as depression, fatigue, pain, spasticity and tremors. Treatment programs and services may include exercise and physical therapy, occupational therapy to help maintain your independence in daily living, and stress reduction.

Many new treatments, such as the use of statins or cholesterol-lowering drugs, are being developed and tested. Patients who are evaluated at the Multiple Sclerosis Center have the opportunity to participate in these studies of new treatments.

Peripheral Neuropathy

Peripheral neuropathy is a common neurological disorder resulting from damage to the peripheral nerves. Peripheral nerves, located outside of the brain and spinal cord, provide the means of communication between the brain and other parts of the body, including muscles, skin, internal organs and blood vessels. Neuropathies affect at least 20 million people in the United States alone.

If one nerve is damaged, the condition is referred to as mononeuropathy. If many nerves are involved, it is called ***polyneuropathy.***

Although there are some cases in which the cause is unknown, peripheral neuropathies have many well-defined causes, including:

- Alcoholism
- Amyloidosis

- Autoimmune disorders, such as Guillain-Barre syndrome
- Bell's palsy
- Cancer
- Carpal tunnel syndrome
- Chronic kidney failure
- Connective tissue disease, such as rheumatoid arthritis, lupus and sarcoidosis
- Diabetes mellitus — nearly 60 percent of all people with diabetes suffer from peripheral neuropathy
- Infectious disease, such as Lyme disease, HIV/AIDS and hepatitis B
- Liver failure
- Radiculopathy
- Vitamin deficiencies

Symptoms

Although there are numerous causes of peripheral neuropathies, they do share some common symptoms, including:

- Weakness, numbness and pain in the hands, legs and/or feet
- Paresthesia, a condition that causes abnormal sensations such as burning, tickling, pricking or tingling

Diagnosis

A crucial part of diagnosing neuropathy is to identify the cause of the underlying condition. Both physical and neurological exams will be performed. A number of tests may be used to determine the underlying cause of neuropathy and rule out other conditions. Along with blood and urine tests, the following also may be performed:

- Electroencephalography (EEG) — This test records electrical activity inside the brain.
- Spinal Tap — During this test, also called a lumbar puncture, a special needle is placed into the lower back in the spinal canal, the area around the spinal cord. A small amount of cerebral spinal fluid (CSF) is removed for testing. CSF is the fluid that bathes the brain and spinal cord.
- Computed Tomography (CT) — A CT scan is a series of detailed pictures of the brain, created by a computer linked to an X-ray machine.
- Magnetic Resonance Imaging (MRI) — This scan provides pictures of the brain, using a powerful magnet linked to a computer.
- Nerve Conduction Velocity (NCV) Studies — These studies record the speed at which impulses travel through nerves and measure electrical responses.
- Electromyography (EMG) — This test records the electrical activity in muscle tissue and is used to distinguish neuropathy from other neurological conditions.

In addition, your doctor may suggest a nerve or muscle biopsy to confirm the diagnosis. Biopsy involves removing tissue for microscopic evaluation and chemical analysis.

Treatment

Therapy for peripheral neuropathy focuses on treating the underlying cause. For example, if the condition is caused by diabetes, therapy will aim to control diabetes. If a tumor or ruptured disc is the cause, treatment may involve surgery to remove the tumor or repair the ruptured disc. In other cases, treatment may focus on managing pain.

Fortunately, peripheral nerves have a remarkable ability to regenerate themselves. New treatments that are currently being developed and studied use nerve growth factors or gene therapy to treat peripheral neuropathy. This work may offer improved chances for recovery in the future.

Post-Herpetic Neuralgia

Post-herpetic neuralgia (PHN) is caused by damage that occurs to the peripheral nerve fibers during a shingles infection. On average, one out of every five patients with shingles develops PHN. However, the risk of having the condition increases with age. People over age 60 who have had shingles have as much as a 50 percent chance of developing PHN.

Symptoms

Pain associated with post-herpetic neuralgia (PHN) can be very intense, often described by patients as deep, aching and unbearable. In some cases, even a light touch, like the pressure of a shirt or gust of wind, can cause intense pain.

Because of the intensity of pain, it can interfere with daily life, including sleep and appetite. Depression is common because of the severe pain and social isolation that can occur.

Some PHN patients have to stop their normal activities for months. And for some, the pain can last for several years.

Diagnosis

There are no specific tests available to test for post-herpetic neuralgia (PHN). However, people who have recovered from shingles and experience an ongoing pain in the region affected by the initial shingles rash, should contact their doctor to determine if they have developed PHN

Treatment

There are a variety of effective pain relief medications, but unfortunately no cure for post-herpetic neuralgia (PHN). In most cases, the pain of PHN subsides with time.

Treatment options that provide pain relief include:

- Skin patches
- Anti-seizure medication
- Narcotic analgesics
- Antidepressants

Spinal Cord Tumor

Early diagnosis can be an important factor in the outcome of tumors in the spinal cord. Primary spinal cord tumors — tumors that originate in the spine rather than spread to the spine from elsewhere in the body — are usually benign. They are so rare that they account for only a half of one percent of all newly diagnosed tumors. Malignant primary tumors of the spinal cord are even less common.

Most spinal cord cancers are metastatic or secondary cancers, meaning they arise from cancers that have spread to the spinal cord. Cancers that may spread to the spine include lung, breast, prostate, head and neck, gynecologic, gastrointestinal, thyroid, melanoma, renal cell carcinoma and others.

Symptoms

Tumors within the spinal cord generally cause detectable symptoms, while spinal tumors outside of the cord may develop for some time before symptoms emerge. Common symptoms include:

- Back pain
- Cold sensation in the legs, feet or hands
- Loss of bowel control
- Loss of sensation, particularly in the legs
- Muscle weakness and difficulty walking
- Muscle contractions or spasms

Diagnosis

The first test to diagnose brain and spinal column tumors is a neurological examination. Special imaging techniques such as computerized tomography (CT), magnetic resonance imaging (MRI) and positron emission tomography (PET) are also performed.

Laboratory tests include the electroencephalogram (EEG) and the spinal tap. A biopsy, a surgical procedure in which a sample of tissue is taken from a suspected tumor, helps doctors diagnose the type of tumor.

Treatment

Surgery

While surgery is increasingly recommended for benign and malignant primary spinal cord tumors, the role of surgery in spinal metastasis, or cancer that has spread to the spine, is controversial. Recent developments in imaging as well as new surgical tools and techniques, such as ultrasonic aspirators and lasers, have significantly expanded the role of surgery as an intervention.

For metastatic tumors with spinal cord compression, some neurosurgeons may perform surgery in selected patients to relieve pressure and pain, reconstruct or stabilize the spine, preserve mobility and bowel and bladder function, and to maximize quality of life. Some doctors may only recommend surgery for patients with a single metastatic tumor and no evidence of cancer growing at another site.

Radiation Therapy

Most patients with primary spinal cord tumors will not require radiation therapy. Radiation, however, is used to treat spinal cord compression due to metastatic cancer or cancer that has spread from other locations. Other targets of radiation include some primary cancers of the spine and more rarely, benign or low-grade spinal cord tumors that cannot be completely removed surgically.

The spinal cord is even more sensitive to the effects of radiation than the brain. Our radiation oncologists work carefully to minimize the risk of radiation-induced damage to normal spinal tissue since it can be progressive and irreversible. The thoracic spinal cord segments, or those located near the chest where half of all spinal tumors occur, are the most sensitive to the effects of radiation.

Radiosurgery with an advanced device called the CyberKnife may be an option for some patients. The CyberKnife is a painless, non-invasive treatment that delivers high doses of precisely targeted radiation to destroy tumors or lesions. Radiosurgery minimizes radiation exposure to healthy tissue surrounding the tumor.

The CyberKnife uses a robotic arm to deliver highly focused beams of radiation. The flexibility of the robotic arm makes it possible to treat areas of the body, such as the spine and spinal cord, that cannot be treated by other radiosurgery techniques.

Chemotherapy

Chemotherapy, similar to that used for brain tumors, may be recommended in adults for spinal gliomas that progress after surgery and radiation.

Chemotherapy is the use of drugs to kill cancer cells. Your doctor may use just one drug or a combination, usually giving the drugs by mouth or by injection into a blood vessel or muscle. Intrathecal chemotherapy involves injecting the drugs into the cerebrospinal fluid.

Chemotherapy is usually given in cycles: a treatment period followed by a recovery period, then another treatment period, and so on. Patients often do not need to stay in the hospital for treatment. Most drugs can be given in the doctor's office or the outpatient clinic. However, depending on the drugs used, the way they are given and the patient's general health, a short hospital stay may be necessary

Stroke

Stroke is the fourth leading cause of death and the leading cause of disability in the United States. When a stroke occurs, a blood vessel in the brain becomes blocked or bursts, sometimes causing permanent brain injury or even death. However, prompt treatment and follow-up care may protect brain cells and help patients lead healthy, productive lives.

There are two main types of strokes:

- **Ischemic Stroke** - This type of stroke accounts for about 80 to 85 percent of all strokes in the United States. With ischemic stroke, the blood supply to a part of the brain becomes blocked. This prevents oxygen and nutrients from reaching brain cells. Within a few minutes, these cells may begin to die.

  The underlying cause for this type of obstruction is usually atherosclerosis, a condition in which plaque or fatty deposits within the wall of the arteries in the brain and neck can lead to obstruction or narrowing. These fatty deposits can cause cerebral thrombosis or cerebral embolism. With a cerebral thrombosis, a blood clot forms within the blood vessel. Cerebral embolisms are clots that can form at another location in the circulatory system, break loose from an artery wall or from the inside

lining of the heart, travel through the brain's blood vessels and can lodge in an artery in the brain.

- **Hermorrhagic Stroke** - With hemorrhagic stroke a blood vessel within the brain leaks or ruptures and bleeds into the surrounding brain tissue. This is called an intracerebral hemorrhage. The blood can accumulate and exert pressure on the surrounding tissue. High blood pressure is a common cause of intracerebral hemorrhage. In a subarachnoid hemorrhage, blood leaks under the lining of the brain. This is often caused by a small bubble on an artery known as an aneurysm.

Risk Factors for Stroke

Risk factors for stroke that cannot be changed:

- Family History - The risk of having a stroke is higher for people whose parents or siblings have had a stroke.
- Age - Stroke risk increases with age doubling every 10 years after age 55.
- Gender - Before age 55, men are more likely than women to have strokes. After 55, the risk is the same for men and women. However, women are more likely than men to die of stroke.
- History of Prior Stroke, TIA or Heart Attack - A person who has had a stroke in the past is at much greater risk for having another one. Risk of stroke after a TIA is greatest within the first 48 to 72 hours. Therefore, you should seek immediate medical attention for all acute neurologic changes, even if they have resolved.
- Race - African Americans have higher incidence of stroke and a higher risk of death from a stroke than Caucasians do. Asian Americans have higher incidence of hemorrhagic stroke than other ethnic groups.

Risk factors for stroke that are modifiable:

- High Blood Pressure - This is probably the most important modifiable risk factor for stroke. Controlling high blood pressure will greatly reduce your risk of stroke and heart attack.
- Cardiovascular Disease - Congestive heart failure, a previous heart attack, a diseased aortic valve and atrial fibrillation can all raise the risk of stroke.
- Cigarette Smoking - The risk of stroke is two to three times greater for smokers versus nonsmokers. The use of oral contraceptives with cigarette smoking greatly increases the risk of stroke.
- Carotid Artery Disease - Fatty deposits from atherosclerosis may cause significant narrowing in the carotid arteries. This can limit blood flow to the brain as well as acts as a potential source for cerebral emboli.
- Diabetes - Diabetes doubles stroke risk. Many people with diabetes also have high blood pressure, obesity and high cholesterol, which increase their stroke risk even further.

- Undesirable Blood Cholesterol Levels - High blood levels of low-density lipoprotein (LDL) cholesterol and low levels of high-density lipoprotein (HDL) cholesterol increase stroke risk.
- Obesity - Excess weight can double the risk of an ischemic stroke.
- Lack of Exercise and Physical Activity - Both increase the risk of high blood pressure and therefore the risk for stroke. Taking the stairs, going on a brisk walk, doing some kind of activity for at least 30 minutes every day will help decrease your stroke risk.
- Use of Birth Control and Hormone Therapy - Women who use birth control pills, especially if they smoke and are over age 35, have a higher risk of stroke. There is also a higher risk of stroke among women using hormone therapy for menopause.

Signs and Symptoms

Common symptoms of stroke include:

- Sudden paralysis of a leg, arm or one side of the face
- Sudden trouble speaking or understanding speech
- Sudden vision problems, such as blurred or double vision
- Sudden loss of coordination or problems with balance
- A severe, sudden headache without apparent cause
- Sudden numbness, weakness or dizziness

Transient Ischemic Attack (TIA)

Transient ischemic attacks are sometimes called "mini-strokes." Although strokes typically occur without warning, some people may feel a temporary numbness, weakness or tingling in one arm or leg, or problems with speech, vision or balance before the actual onset of the stroke. This occurs because the blood supply to the brain is temporarily reduced, called a transient ischemic attack (TIA).

TIAs usually last a few minutes to hours and may not cause immediate permanent injury to the brain. However, a TIA is a sign that the risk of a permanent stroke is great. TIA is an emergency. Patients with TIAs should be seen right away, just like those with stroke symptoms that don't go away.

Diagnosis

Your neurologist will perform a physical examination to determine if you've had a stroke. Your examination may include blood or urine tests, an electrocardiogram (ECG or EKG), electroencephalogram (EEG) or imaging tests.

Imaging tests may include:

- Arteriography — This shows arteries in the brain that can't be seen in regular X-rays. An arteriogram may be performed if other tests don't reveal the cause of the stroke. Your doctor will make a small incision, usually in your groin, then insert a catheter, which is a flexible, thin tube, carefully through your arteries and into your carotid or vertebral artery.

  Your doctor will then inject a dye into the catheter that helps your cranial arteries appear more clearly in an X-ray image.

- Carotid Ultrasonography — This machine sends sound waves into the tissues in your neck, which creates images on a screen. These images may reveal narrowing in the carotid arteries.
- Computed Tomography (CT) Scan — With this test, X-ray beams are used to create a three-dimensional image of the brain, the brain's blood vessels and main blood flow.
- Magnetic Resonance Angiography (MRA) — This procedure uses a strong magnetic field to show the arteries in the neck and brain.
- Magnetic Resonance Imaging (MRI) — Using a strong magnetic field, an MRI can generate a three-dimensional image of the brain. An MRI is often used to locate an area of the brain that's been damaged by an ischemic stroke.

Treatment

The next step in treating a stroke is to carefully control and monitor your blood pressure. Once your blood pressure is under control, we focus on cholesterol, smoking cessation, control of diabetes and analysis of any heart conditions you may have.

Ischemic Stroke:

Also, there are surgical techniques that may be used to prevent stroke including:

- Carotid Endarterectomy — This surgery is used to remove plaque from carotid arteries to help prevent strokes. The surgeon makes an incision to open up the artery, then removes the plaque and closes the artery.
- Angioplasty and Stenting — During this procedure, your surgeon places a small wire tube down a narrowed artery. A balloon attached to the tube is then inflated, which works to widen the artery. A small tube called a stent may be left within the widened artery to help keep it from closing up in the future.

Hemorrhagic Stroke:

Treatment for hemorrhagic stroke is designed to allow the brain to heal safely and prevent further hemorrhage. This involves using medications to reduce swelling of brain tissue. Occasionally, surgery can help remove clotted blood from around damaged brain tissue. If you have an aneurysm, it can be repaired either by open surgery or by a technique that eliminates the aneurysm from inside the vessel with the help of arteriography.