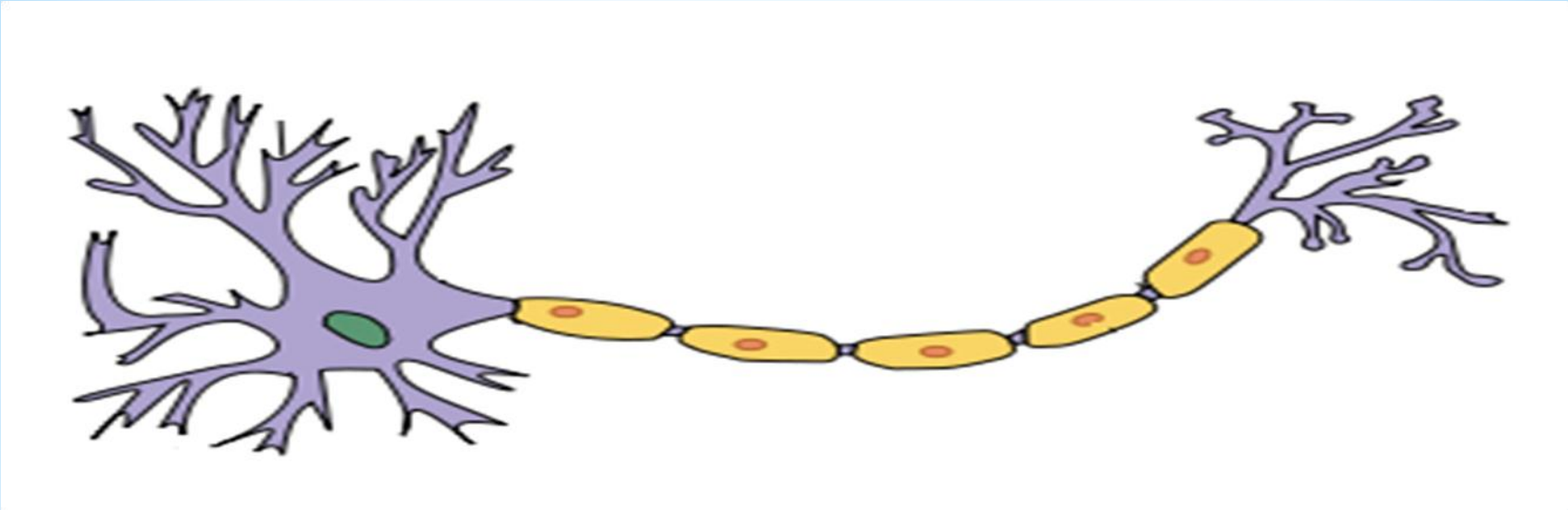


* Peripheral nervous system disorder

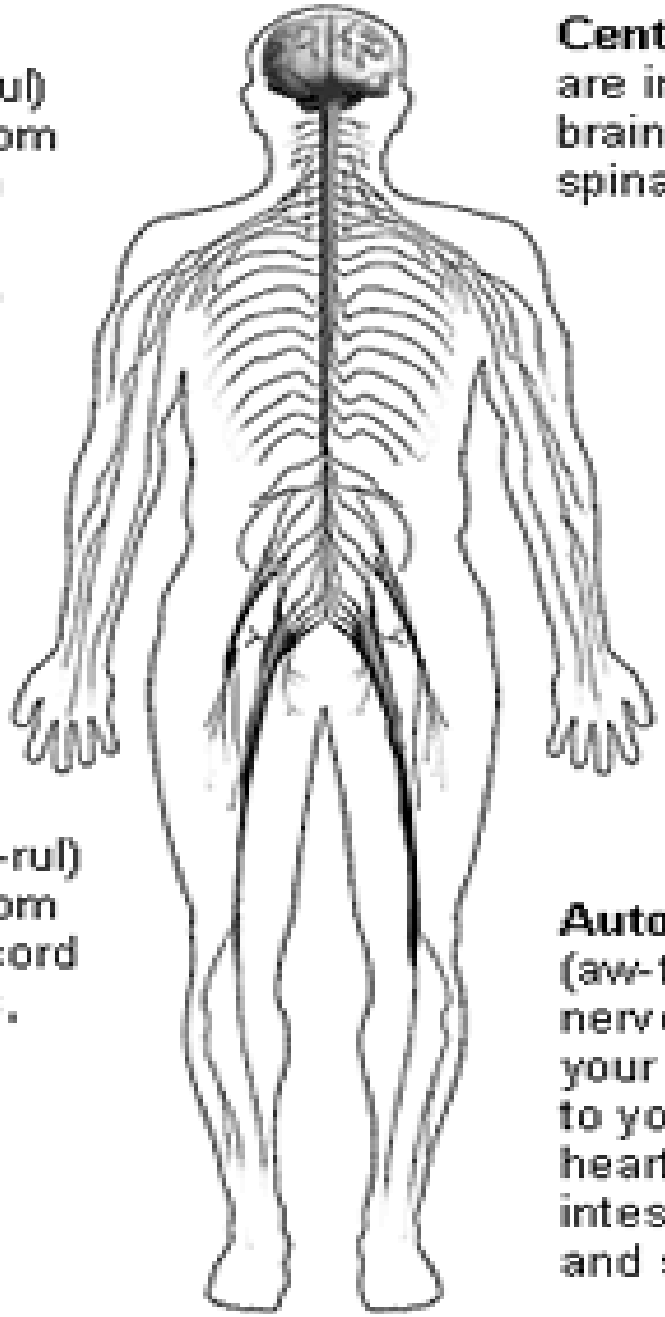
Dr Nanis Ghareeb

*Introduction :

* Peripheral neuropathy, often shortened to neuropathy, is a general term describing disease affecting the peripheral nerves, meaning nerves beyond the brain and spinal cord.
* Damage to peripheral nerves may impair sensation, movement, gland or organ function depending on which nerves are affected; in other words, neuropathy affecting motor, sensory, or autonomic nerves result in different symptoms. More than one type of nerve may be affected simultaneously.

Cranial (KRAY-nee-ul) nerves go from your brain to your eyes, mouth, ears, and other parts of your head.

Central nerves are in your brain and spinal cord.



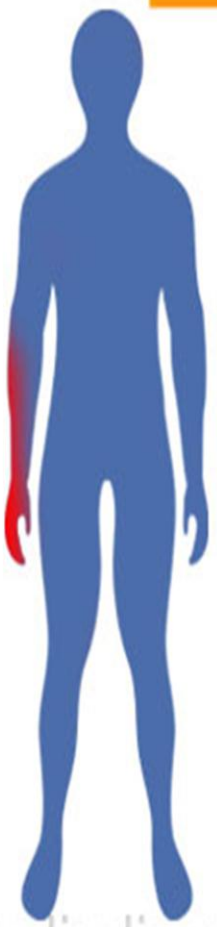
Peripheral (puh-RIF-uh-rul) nerves go from your spinal cord to your arms, hands, legs, and feet.

Autonomic (aw-toh-NOM-ik) nerves go from your spinal cord to your lungs, heart, stomach, intestines, bladder, and sex organs.

* Peripheral neuropathy may be acute (with sudden onset, rapid progress) or chronic (symptoms begin subtly and progress slowly), and may be reversible or permanent.
* Neuropathy affecting just one nerve is called "mononeuropathy" and neuropathy involving nerves in roughly the same areas on both sides of the body is called "symmetrical polyneuropathy" or simply "polyneuropathy".
* When two or more separate nerves in disparate areas of the body are affected it is called "mononeuritis multiplex", "multifocal mononeuropathy", or "multiple mononeuropathy

* classification of peripheral neuropathy

Types of Peripheral Neuropathy



Mononeuropathy

Polyneuropathy

Mononeuropathy Multiplex

What are common causes of peripheral neuropathy?

* Physical injury (trauma) is the most common cause of acquired single-nerve injury. Injury from automobile accidents, falls, sports, and medical procedures can stretch, crush, or compress nerves, or detach them from the spinal cord. Ulnar neuropathy and carpal tunnel syndrome are common types of neuropathy from trapped or compressed nerves at the elbow or wrist.
* Diabetes is the leading cause of polyneuropathy in about 60 - 70 percent of people with diabetes have mild to severe forms of damage to sensory, motor, and autonomic nerves.
* Vascular and blood problems that decrease oxygen supply to the peripheral nerves can lead to nerve tissue damage. Diabetes, smoking, and narrowing of the arteries from high blood pressure or atherosclerosis . Blood vessel wall thickening and scarring from vasculitis can impede blood flow

* Systemic (body-wide) autoimmune diseases, in which the immune system mistakenly attacks a number of the body's own tissues, can directly target nerves or cause problems when surrounding tissues compress or entrap nerves. Sjögren's syndrome, lupus, and rheumatoid arthritis
* Autoimmune diseases that attack nerves only are often triggered by recent infections. Damage to the motor fibers that go to the muscle includes visible weakness and muscle shrinking seen in Guillain-Barré syndrome and chronic inflammatory demyelinating polyneuropathy.
* Hormonal imbalances can disturb normal metabolic processes, leading to swollen tissues that can press on peripheral nerves underactive thyroid (hypothyroidism).

* What are common causes of peripheral neuropathy?

* Kidney and liver disorders can lead to abnormally high amounts of toxic substances in the blood that can damage nerve tissue. Most individuals on dialysis because of kidney failure develop varying levels of polyneuropathy.
* Nutritional or vitamin imbalances, alcoholism, and exposure to toxins can damage nerves and cause neuropathy. Vitamin B12 deficiency and excess vitamin B6 are the best known vitamin-related causes. Several medications have been shown to occasionally cause neuropathy.
* Certain cancers and benign tumors cause neuropathy in various ways. Tumors sometimes infiltrate or press on nerve fibers.
* **Inherited disorders.** such as Charcot-Marie-Tooth disease are hereditary types of neuropathy.

* What are common causes of peripheral neuropathy?

* certain chemotherapy drugs used to treat cancer cause polyneuropathy in an estimated 30 to 40 percent of users. Chemotherapy-induced peripheral neuropathy may continue long after stopping chemotherapy. Radiation therapy also can cause nerve damage, sometimes starting months or years later.
* Infections can attack nerve tissues and cause neuropathy. Viruses such as varicella-zoster virus (which causes chicken pox and shingles), West Nile virus, cytomegalovirus, leprosy and herpes simplex target sensory fibers, causing attacks of sharp, lightning-like pain. Lyme disease, carried by tick bites, can cause a range of neuropathic symptoms, often within a few weeks of being infected. The human immunodeficiency virus (HIV), which causes AIDS, can extensively damage the central and peripheral nervous systems. An estimated 30 percent of people who are HIV-positive develop peripheral neuropathy; 20 percent develop distal (away from the center of the body) neuropathic pain.

*epidemiology

* Approx. 2.4% of the population is affected by peripheral nerve disorders
* Prevalence increases to 8.0% in older populations.
* Diabetic neuropathy occurs in approximately 50% of individuals with chronic type 1 and type 2 diabetes.
* Globally, leprosy remains a common cause of peripheral neuropathy, with the highest prevalence in South East Asia.
* The most common genetic sensorimotor polyneuropathy is Charcot-Marie-Tooth disease, specifically, type 1a.
* The most common mononeuropathy is carpal tunnel syndrome.

CATEGORIES AND ETIOLOGIES OF PERIPHERAL NEUROPATHIES

- Metabolic or nutritional.
- Drug induced.
- Industrial or environmental toxins.
- Connective tissue processes or vasculitis.
- Infections or infectious processes.
- Inflammatory processes.
- Neoplasms.
- Trauma or compressions.
- Entrapment syndromes.
- Heriditory disorders.

Signs and symptoms

- Gradual onset of numbness, prickling or tingling in your feet or hands, which can spread upward into your legs and arms
- Sharp, jabbing, throbbing or burning pain
- Extreme sensitivity to touch
- Pain during activities that shouldn't cause pain, such as pain in your feet when putting weight on them or when they're under a blanket
- Lack of coordination and falling
- Muscle weakness
- Feeling as if you're wearing gloves or socks when you're not
- Paralysis if motor nerves are affected

Autonomic nerve damage :common symptoms include:

* excess sweating, heat intolerance,
* inability to expand and contract the small blood vessels that regulate blood pressure,
* gastrointestinal symptoms. Although rare, some people develop problems eating or swallowing if the nerves that control the esophagus are affected.

*Signs and symptoms

ptoms of Peripheral Neuropathy Depend on the Peripheral Nerve Affec

Sensory nerve damage

Unusual
ensations

Pain from light
touch

Burning

Numbness

Tingling

Balance
problems

Motor nerve damage

Muscle cramping

Twitching

Reflex abnormalities

Autonomic nerve damage

Excess
sweating

Heat
intolerance

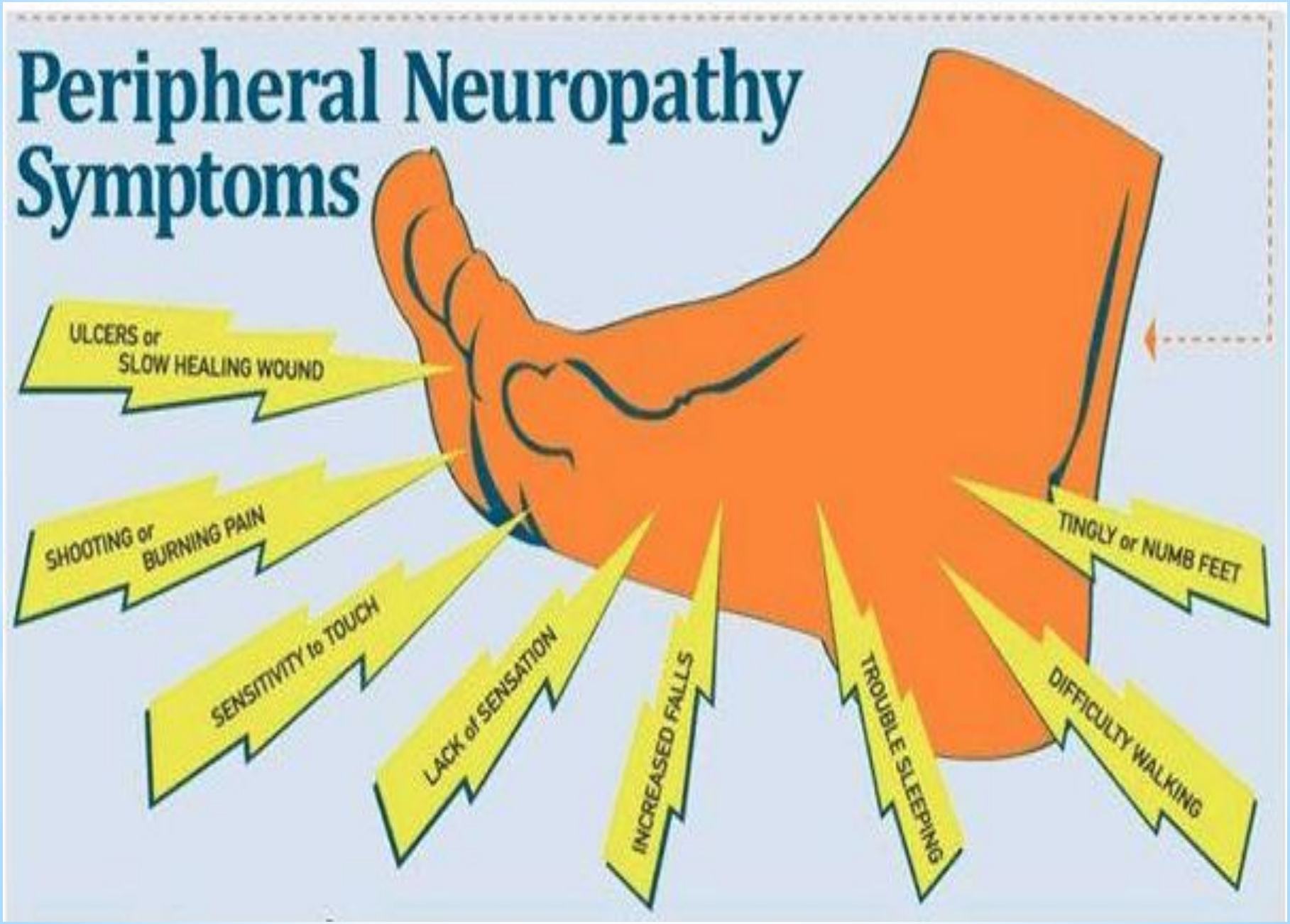
Getting
full quickly

Impotence

Orthostatic hypotension
(dizziness or fainting
after standing up)

ell

Peripheral Neuropathy Symptoms


Peripheral Neuropathy Symptoms
ULCERS or SLOW HEALING WOUND
SHOOTING or BURNING PAIN
SENSITIVITY to TOUCH
LACK of SENSATION
INCREASED FALLS
TROUBLE SLEEPING
DIFFICULTY WALKING
TINGLY or NUMB FEET

* Complications of peripheral neuropathy can include:

- **Burns and skin trauma.** You might not feel temperature changes or pain on parts of your body that are numb.
- **Infection.** Your feet and other areas lacking sensation can become injured without your knowing. Check these areas regularly and treat minor injuries before they become infected, especially if you have diabetes.
- **Falls.** Weakness and loss of sensation may be associated with lack of balance and falling.

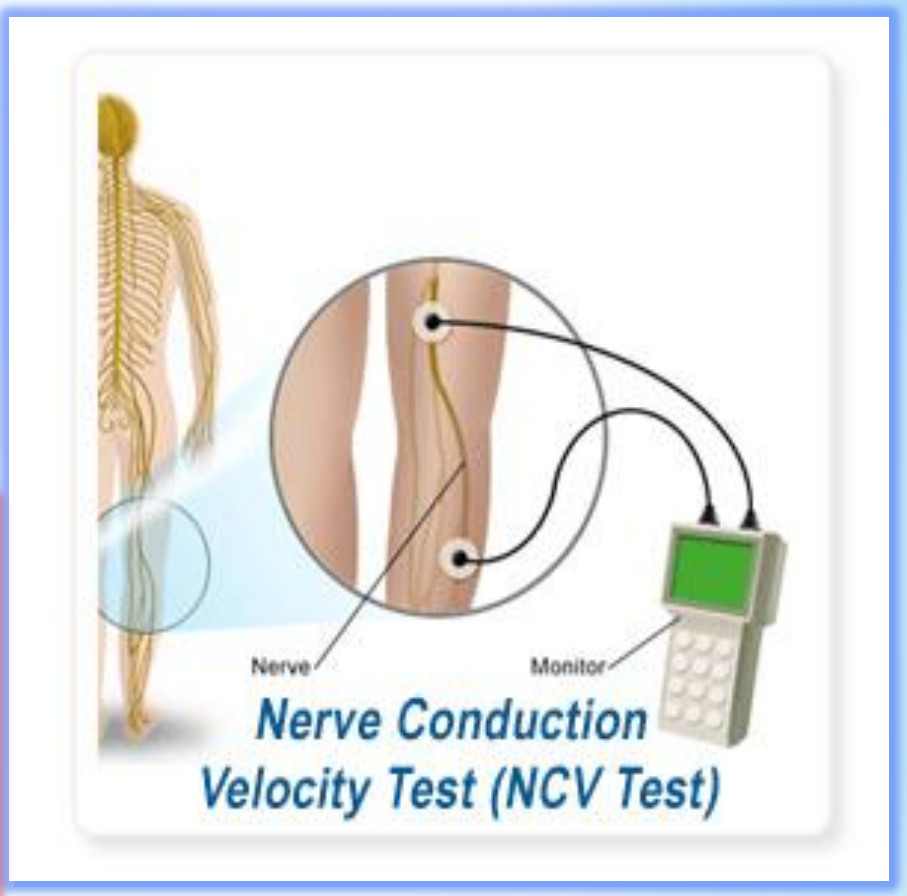
*Complications

How is peripheral neuropathy diagnosed?

* Medical history. A doctor will ask questions about symptoms and any triggers or relieving factors throughout the day, work environment, social habits, exposure to toxins, alcohol use, risk of infectious diseases, and family history of neurological diseases.
* Physical and neurological exams. A doctor will look for any evidence of body-wide diseases that can cause nerve damage, such as diabetes. A neurological exam includes tests that may identify the cause of the neuropathic disorder as well as the extent and type of nerve damage.

* Body fluid tests. Various blood tests can detect diabetes, vitamin deficiencies, liver or kidney dysfunction, other metabolic disorders, infections and signs of abnormal immune system activity. Less often other body fluids are tested for abnormal proteins or the abnormal presence of immune cells or proteins associated with some immune-mediated neuropathies.
* Physiologic tests of nerve function:
  - Nerve conduction velocity (NCV) tests measure signal strength and speed along specific large motor and sensory nerves. They can reveal nerves and nerve types affected and whether symptoms are caused by degeneration of the myelin sheath or the axon.
  - Electromyography (EMG) involves inserting very fine needles into specific muscles to record their electrical activity at rest and during contraction. EMG tests, detects abnormal muscular electrical activity in motor neuropathy, and can help differentiate between muscle and nerve disorders.


Electromyography
Test


Nerve
Monitor
Nerve Conduction
Velocity Test (NCV Test)

* Neuropathology tests of nerve appearance:

- Nerve biopsy involves removing and examining a sample of nerve tissue, usually a sensory nerve from the lower leg . Although a nerve biopsy can provide the most detailed information about the exact types of nerve cells and cell parts affected, it can further damage the nerve and leave chronic neuropathic pain and sensory loss.
- Neurodiagnostic skin biopsy allows specialists to examine nerve fiber endings following removal of only a tiny piece of skin (usually 3 mm diameter) under local anesthesia. Skin biopsies have become the gold standard for diagnosing small fiber neuropathies that don't affect standard nerve conduction studies and electromyography.

* Radiology imaging tests:

- Magnetic resonance imaging (MRI) of the spine can reveal nerve root compression ("pinched nerve"), tumors, or other internal problems.
- Computed tomography (CT) scans of the back can show herniated disks, spinal stenosis (narrowing of the spinal canal), tumors, bone and vascular irregularities that may affect nerves.

Diagnosis of Peripheral Neuropathy

Physical Examination

Blood Tests

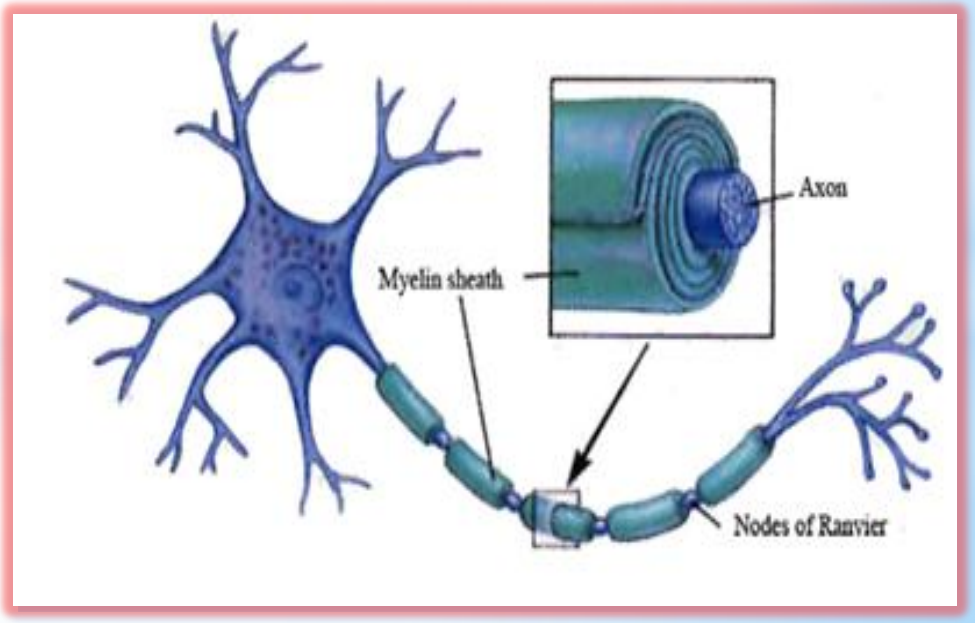
MRI

Skin Biopsy

Electromyography

Prognosis

* In those diseases where peripheral nerves suffer damage through axonal degeneration, the prognosis is poorer, as the recovery of the nerve is more challenging. For clinical improvement to take place, the axon must regenerate itself, and reinnervate the affected muscle or organ.
* The prognosis of diseases which occur secondary to segmental demyelination is more favorable because remyelination is achieved more quickly, allowing the return of function of the axon.



* **Manage underlying conditions :**The best way to prevent peripheral neuropathy is to manage medical conditions that put you at risk, such as diabetes, alcoholism or rheumatoid arthritis.
* **Make healthy lifestyle choices:**

- **Eat a diet rich in fruits, vegetables, whole grains and lean protein to keep nerves healthy.** Protect against vitamin B-12 deficiency by eating meats, fish, eggs, low-fat dairy foods and fortified cereals. If you're vegetarian or vegan, fortified cereals are a good source of vitamin B-12, but talk to your doctor about B-12 supplements.
- **Exercise regularly.** With your doctor's OK, try to get at least 30 minutes to one hour of exercise at least three times a week.
- **Avoid factors that may cause nerve damage,** including repetitive motions, cramped positions that put pressure on nerves, exposure to toxic chemicals, smoking and overindulging in alcohol

*Prevention

What treatments are available?

- Correcting underlying causes can result in the neuropathy resolving on its own as the nerves recover or regenerate.
- Nerve health and resistance can be improved by healthy lifestyle habits such as maintaining optimal weight, avoiding toxic exposures, eating a balanced diet, and correcting vitamin deficiencies.
- Smoking cessation is particularly important because smoking constricts the blood vessels that supply nutrients to the peripheral nerves and can worsen neuropathic symptoms.
- Exercise can deliver more blood, oxygen, and nutrients to far-off nerve endings, improve muscle strength, and limit muscle atrophy.
- Self-care skills in people with diabetes and others who have an impaired ability to feel pain can alleviate symptoms and often create conditions that encourage nerve regeneration.
- Strict control of blood glucose levels has been shown to reduce neuropathic symptoms and help people with diabetic neuropathy avoid further nerve damage.

* Inflammatory and autoimmune conditions leading to neuropathy can be controlled using:

- immunosuppressive drugs such as prednisone, cyclosporine, or azathioprine.
- Plasmapheresis—a procedure in which blood is removed, cleansed of immune system cells and antibodies, and then returned to the body—can help reduce inflammation or suppress immune system activity.
- Agents such as rituximab that target specific inflammatory cells, large intravenously administered doses of immunoglobulins, and antibodies that alter the immune system, also can suppress abnormal immune system activity.

* Medications for symptomatic treatment and recommended for chronic neuropathic pain
* Surgery is the recommended treatment for some types of neuropathies
* Transcutaneous electrical nerve stimulation (TENS) is a noninvasive intervention used for pain relief in a range of conditions. TENS involves attaching electrodes to the skin at the site of pain or near associated nerves and then administering a gentle electrical current. In some studies TENS has been shown to improve neuropathic symptoms associated with diabetes.

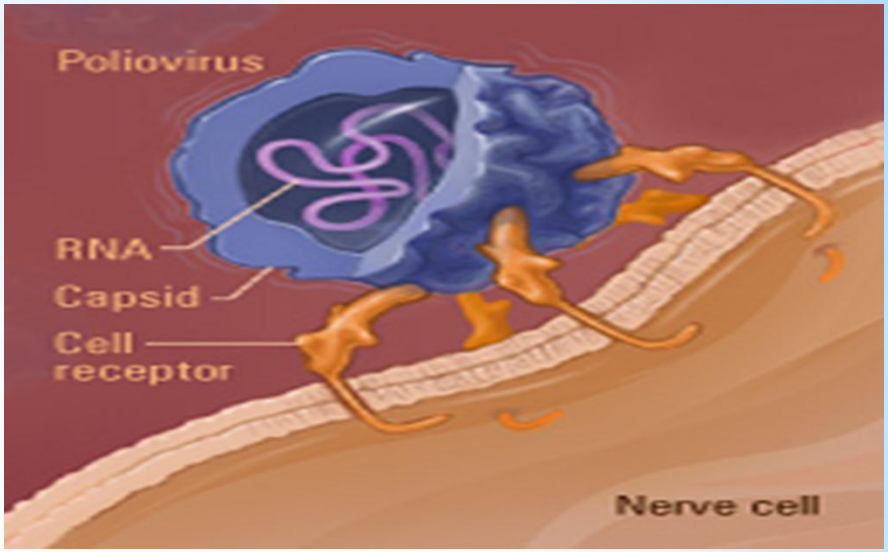
Physiotherapy treatment will improve your mobility and balance as well as your ability with daily tasks important to you. Treatment will depend on your individual symptoms but may involve:

- Individualized exercise program to strengthen muscles and improve fitness levels
- Passive movement of muscles and joints
- Weight bearing through a joint
- Balance training to reduce the risk of falling
- Gait re-education to facilitate mobility and promote independence
- Soft tissue massage
- Pain management. Hydrotherapy treatment relaxes muscle and increases circulation. This type of treatment can also reduce pain and will enable you to maximize your mobility within the water.
- Advice about walking aids, orthotics, calipers and wheelchairs.
- Improving safety with everyday tasks

* Physiotherapy for peripheral neuropathy

Poliovirus:

- Enterovirus (RNA)
- Three serotypes: 1, 2, 3
- Rapidly inactivated: by heat, formaldehyde, chlorine, and ultraviolet light.



*Poliomyelitis

- Transmission Fecal-oral and oral-oral possible (hand to mouth)
- Entry into mouth
- Replication in pharynx, GI tract, local lymphatics
- Hematologic spread to central nervous system
- Viral spread along nerve fibers
- Destruction of motor neuron (anterior horn cell)

*Pathogenesis

*Clinical Features:

- The incubation period for poliomyelitis is commonly 6 to 20 days with a range from 3 to 35 days.
- Clinical Outcomes:

- 90-95% Inapparent infection without symptoms(able to transmit the virus to others)
- 4-8% Minor illness without CNS involvement. May resemble URI or gastroenteritis(abortive poliomyelitis)
- Complete recovery 1-2%
- Nonparalytic with aseptic meningitis 0.1-2%
- Paralytic poliomyelitis usually asymmetric, sensory intact, may recover some or all function

*Paralytic poliomyelitis

- Paralytic symptoms generally begin 1 to 10 days after prodromal symptoms and progress for 2 to 3 days. Generally, no further paralysis occurs after the temperature returns to normal.
- Paralytic polio is classified into three types, depending on the level of involvement. Spinal polio is most common, and accounted for 79% of paralytic cases . It is characterized by asymmetric paralysis that most often involves the legs. Bulbar polio accounts for 2% of cases and leads to weakness of muscles innervated by cranial nerves. Bulbo-spinal polio accounts for 19% of cases and is a combination of bulbar and spinal paralysis.

- **Active immunization:**
  - ✤ Salk vaccine (intramuscular polio trivalent killed vaccine).
  - ✤ Sabin vaccine (oral polio trivalent live attenuated vaccine)

- **Inactivated Poliovirus Vaccine (IPV)(Salk)**

- Highly effective in producing immunity to poliovirus (90% immune after 2 doses and 99% immune after 3 doses)

- Advantages:

✓ Cannot replicate or shed in stool

✓ Use in immunodeficient persons, and their household contacts

- Disadvantages:

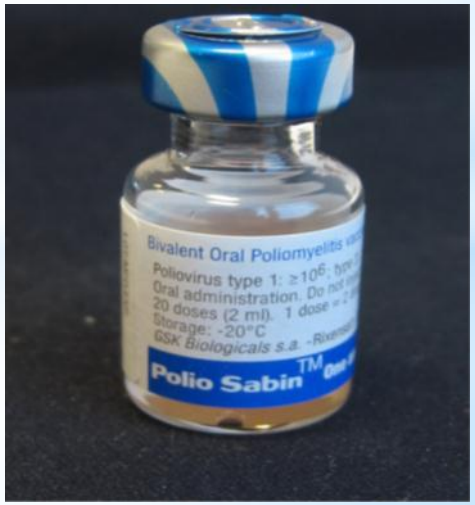
✓ Requires injection

✓ Costs more

✓ Duration of immunity not known

✓ Less local (GI) immunity

*Prevention:



Oral poliovirus vaccine (OPV):

- Highly effective in producing immunity to poliovirus 50% immune after 1 doses >95% immune after 3 doses
- Advantages:

✓ Ease of administration

✓ Local (GI) immunity

✓ Immunity probably lifelong

✓ Spread to contacts

- Disadvantages:

✓ Interference with immunity to all three types of virus

✓ Risk of paralytic disease

Motherhood & More

برنامج التطعيم للأطفال / الأردن

أقرب وقت بعد الولادة، يُعطى مطعوم السل (BCG)
على عمر شهرين (٦١ يوم) يُعطى الطفل الجرعة الأولى من مطعوم شلل الأطفال IPV والمطعوم الخماسي الذي يتكون من : المطعوم الثلاثي DPT (الدفتيريا والسعال الديكي والكزاز)+مطعوم المستدمية النزلية نوع (ب) + مطعوم التهاب الكبد نوع (ب)+ الجرعة الأولى من مطعوم الروتافيروس .
على عمر ٣ اشهر (٩١ يوم) يُعطى الطفل الجرعة الثانية ـ مطعوم شلل الأطفال IPV+OPV +المطعوم الخماسي الذي يتكون من: المطعوم الثلاثي DPT (الدفتيريا والسعال الديكي والكزاز) +مطعوم المستديمة النزلية نوع (ب) + مطعوم التهاب الكبد نوع (ب) + الجرعة الثانية من مطعوم الروتافيروس .
على عمر ٤ شهور (١٢١ يوم) يُعطى الطفل مطعوم شلل الاطفال الفموي OPV + المطعوم الثلاثي DPT (الدفتيريا والسعال الديكي والكزاز)+مطعوم المستديمة النزلية نوع (ب)+ مطعوم التهاب الكبد نوع (ب)على شكل رباعي أو خماسي + الجرعة الثالثة من مطعوم الروتافيروس .
على عمر ٩ شهور (بداية الشهر العاشر) يُعطى الطفل ـ مطعوم الحصبة Measles + مطعوم شلل الأطفال الفموي OPV+ فيتامين أ (١٠٠ الف وحدة دولية).
عند بلوغ الطفل عامه الأول يُعطى الطفل الجرعة الأولى من المطعوم الثلاثي الفيروسي MMR (الحصبة والحصبة الألمانية والنكاف)
على عمر ١٨ شهر يُعطى الطفل الجرعة المدعمة من مطعوم شلل الأطفال الفموي OPV والمطعوم الثلاثي البكتيري DPT + الجرعة الثانية من مطعوم الثلاثي الفيروسي MMR + فيتامين أ (٢٠٠ الف وحدة دولية).

Minimum Interval Between Doses of Polio Vaccine:

- The minimum interval between the first 3 doses of IPV, OPV, or any combination of IPV and OPV is FOUR weeks.
- Poliovirus Vaccines Contraindications and Precautions:

✓ Serious allergic reaction

✓ Moderate or severe acute illness

✓ Immunodeficiency (OPV)

✓ Household contact of immunodeficient person (OPV)

✓ Pregnancy

*Epidemiology

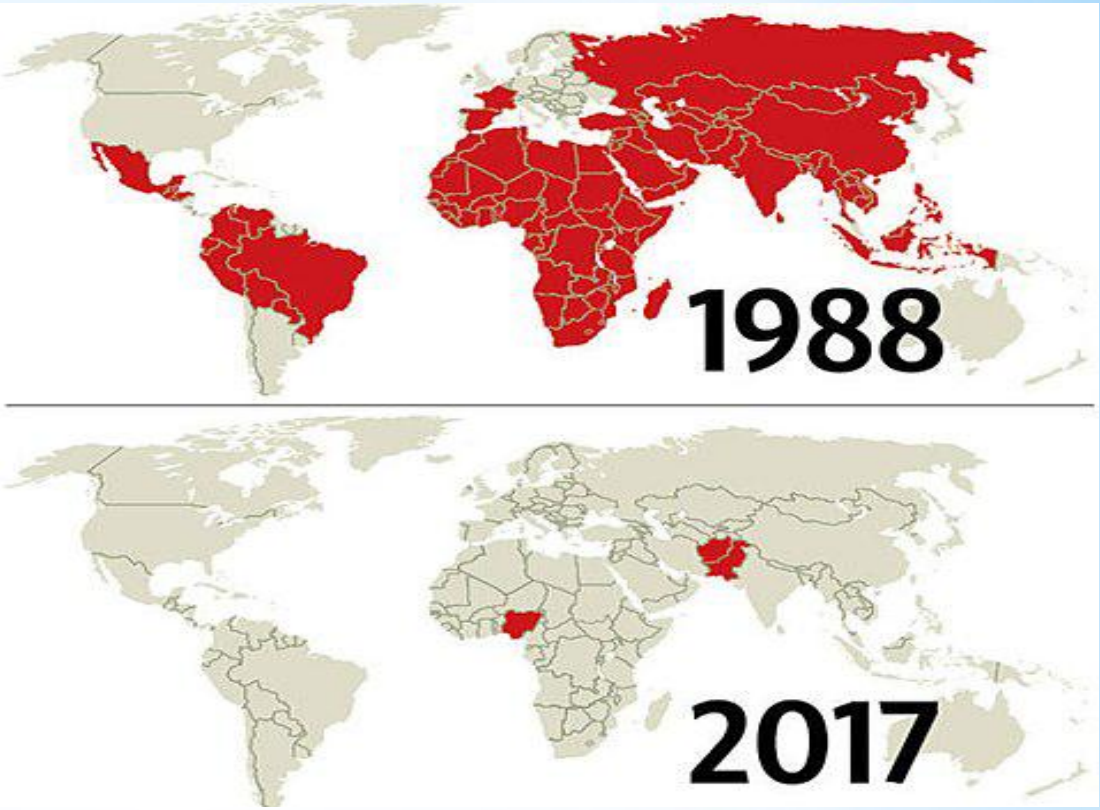
- Reservoir Human
- Transmission : Fecal-oral and Oral-oral possible
- Temporal pattern Summer-fall (temperate)
- Communicability 7-10 days before onset and Virus present in stool 3-6 weeks
- Nearly all epidemics are due to type 1, whereas types 2 and 3 are more often isolated in vaccine-associated poliomyelitis.

The polio endgame

Since 1988, when the WHO resolved to eradicate polio, its footprint has shrunk dramatically. It is only considered endemic in Afghanistan, Pakistan and Nigeria (which hasn't seen a case since 2016). Last year there were only 22 new cases reported.

	1988	2017
Endemic countries	125	3

SOURCE: World Health Organization
TORONTO STAR GRAPHIC



* Polio Eradication:
  Last case in United States in 1979
  Last case in Western Hemisphere in 1991
  Western Hemisphere certified polio free in 1994
  Global eradication goal by 2000

Polio prevalence

Poliomyelitis, also known as polio or infantile paralysis, is a vaccine-preventable systemic viral infection which attacks the nervous system and can cause irreversible paralysis within hours of infection. Children under five are the most vulnerable, but there is a vaccine which prevents the disease.

WITH RECENT CASES OF:

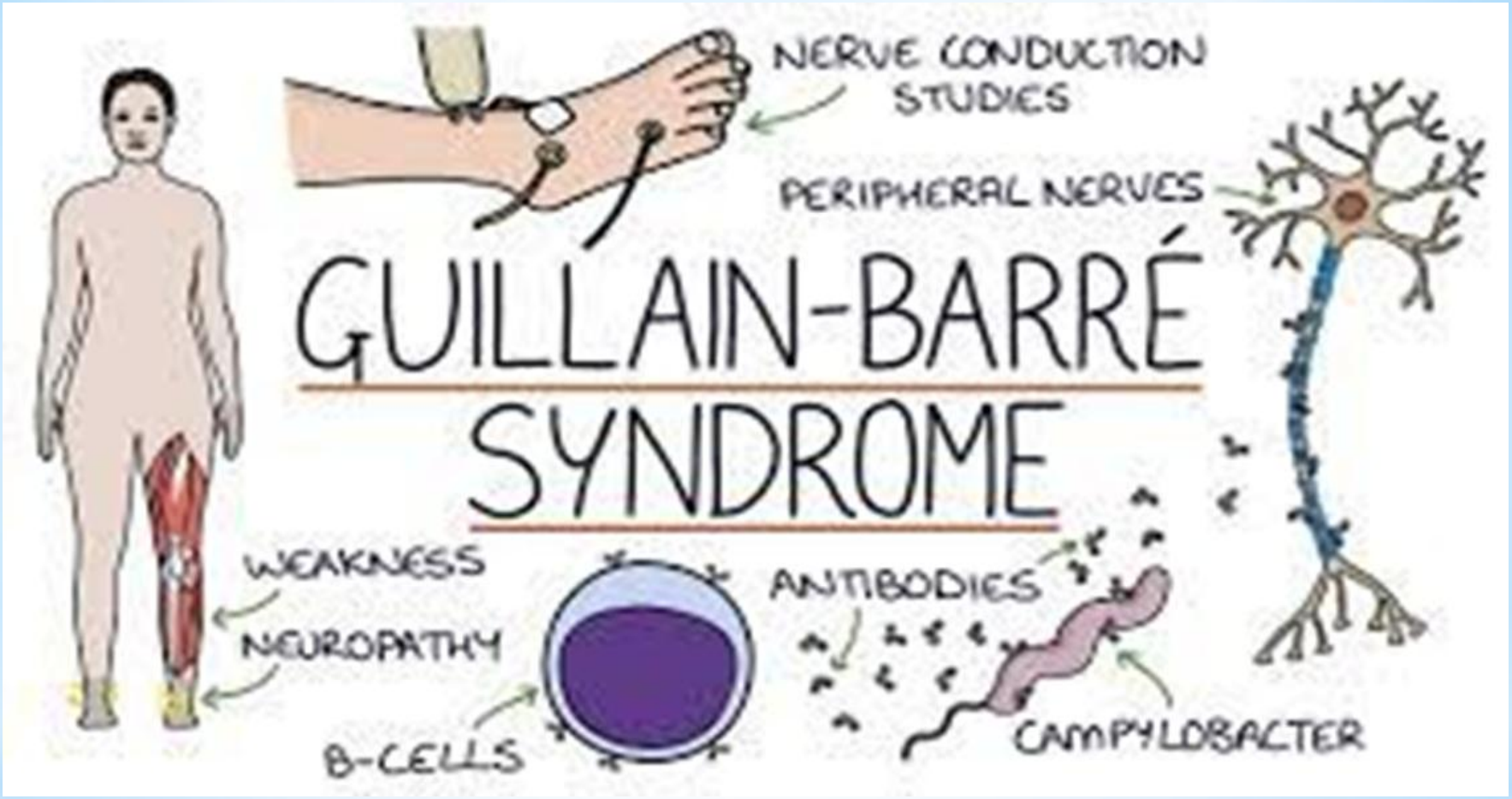
- Wild polio virus
- *Circulating vaccine-derived polio virus

*On rare occasions, an excreted vaccine-virus can continue to circulate for an extended period of time and can genetically change into a form that can paralyse – this is what is known as a circulating vaccine-derived polio virus.

Source: Global Polio Eradication Initiative, World Health Organization. Data is for 2019, year to date.

C. Inton, 20/09/2019

REUTERS



* Guillain Barré Syndrome

- Georges Guillain together with Barré and Strohl, described two cases of self-limiting acute paralysis with peculiar changes in the cerebrospinal fluid. He succeeded his teacher Pierre Marie as professor of neurology at the Salpêtrière hospital in Paris in 1925

*History

- Population-based studies give crude mean annual incidence rates varying from 0.6 to 1.9 per 100,000 population (between 1/91,000 and 1/55,000)
- The mean age of onset is approximately 40 years, but has been recorded as young as 2 to as old as 95
- It has a male predominance
- GBS is the most common cause of acute flaccid paralysis in children.

*Epidemiology

* Is a rare disorder that causes your immune system to attack your peripheral nervous system.
* Damage to these nerves makes it hard for them to transmit signals. As a result, your muscles have trouble responding to your brain.
* No one knows what causes the syndrome. Sometimes it is triggered by an infection, surgery, or a vaccination.
* The first symptom is usually weakness or a tingling feeling in your legs.
* The feeling can spread to your upper body. In severe cases, you become almost paralyzed.

* Pathogenesis and symptoms

* Symptoms are usually equal on both sides of the body (called symmetric). In addition to weak limbs, muscles controlling breathing can weaken to the point that the person must be attached to a machine to help support breathing.

In addition to muscle weakness, symptoms may include:

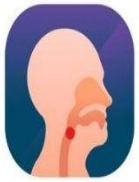
- Difficulty with eye muscles and vision
- Difficulty swallowing, speaking, or chewing
- Pricking or pins and needles sensations in the hands and feet
- Pain that can be severe, particularly at night
- Coordination problems and unsteadiness
- Abnormal heart beat/rate or blood pressure
- Problems with digestion and/or bladder control.

GUILLAIN BARRE SYNDROME

WEAKNESS and **TINGLING** in Your Extremities are Usually the First Symptoms

Guillain Barre Syndrome is a Rare Disorder in which your Body's **Immune System attacks your Nerves**

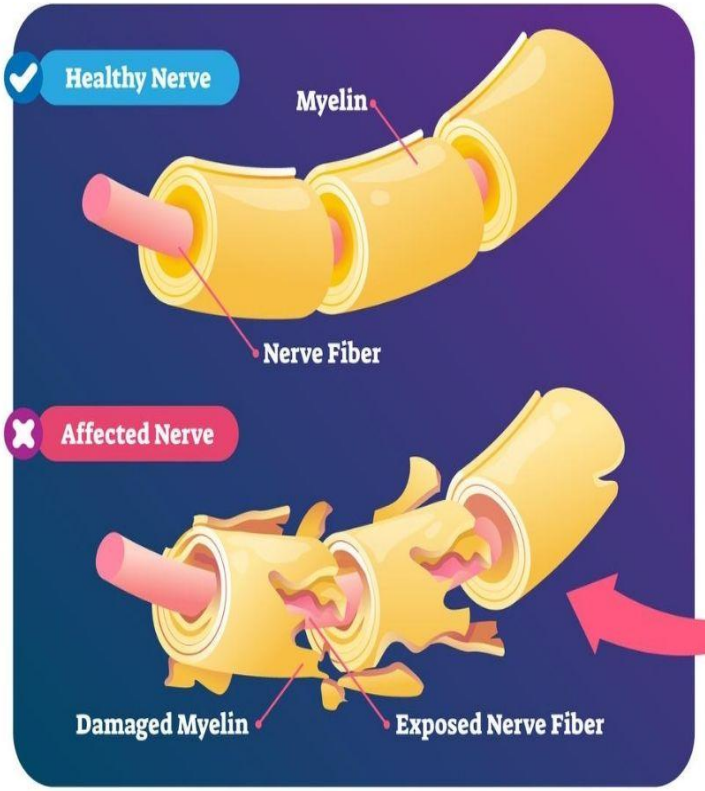
Limb Weakness

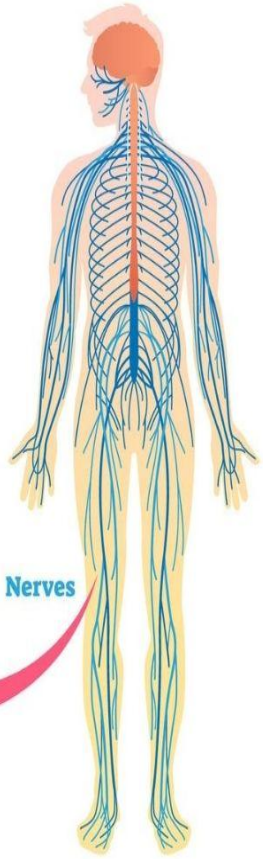


Difficulty Swallowing

Shortness of Breath

Flaccid Paralysis





How does nerve damage occur?

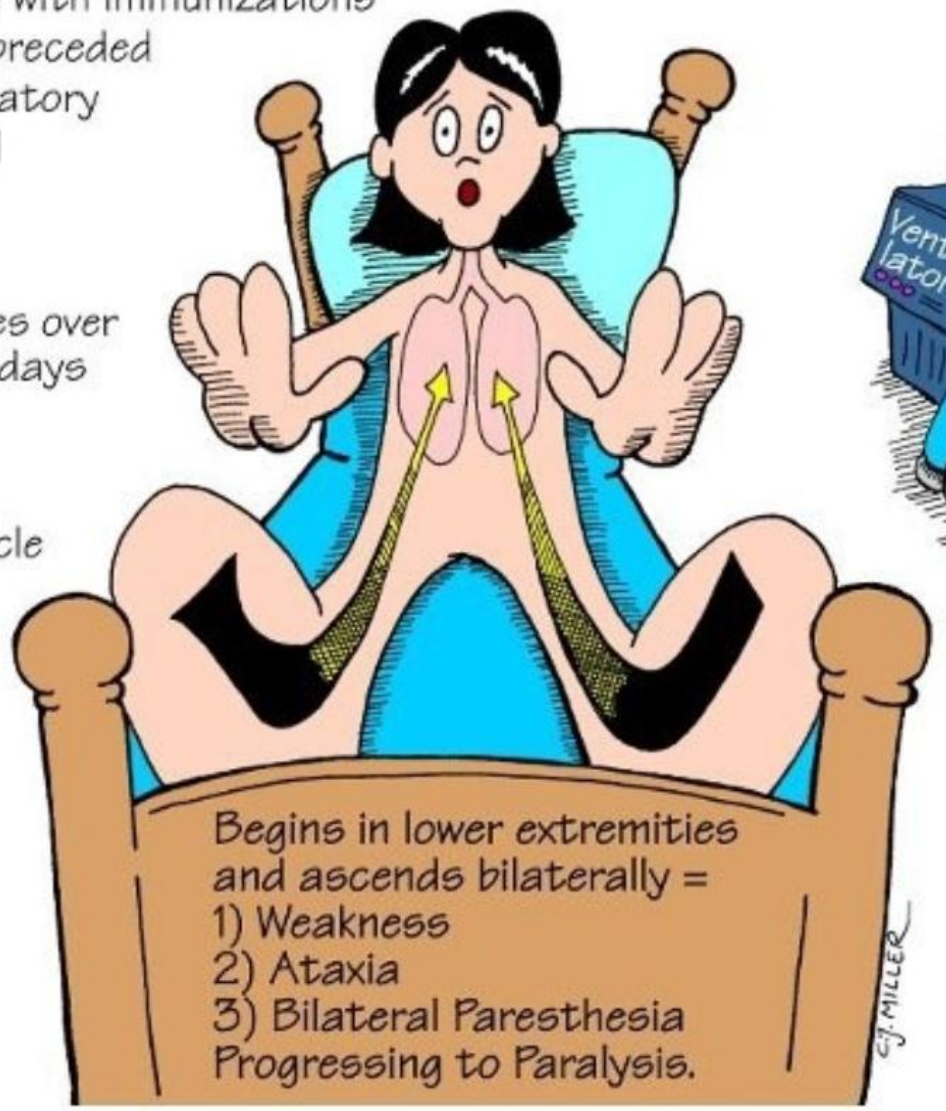
- When Guillain-Barré syndrome is preceded by a viral or bacterial infection, it is possible that the infecting agent has changed the chemical structure of some nerves.
- The immune system treats these nerves as foreign bodies and mistakenly attacks them.
- It is also possible that the virus makes the immune system itself less discriminating and no longer able to recognize its own nerves.
- Some parts of the immune system—special white blood cells called lymphocytes and macrophages—perceive myelin as foreign and attack it.

GUILLAIN-BARRE' SYNDROME

Risk Factors:
- Possibly Autoimmune
- Association with Immunizations
- Frequently preceded by mild repiratory or intestinal infection

- Progresses over hours to days

- Minimal Muscle Atrophy



Symmetrical Paralysis

Causes Problems With:
- Respiration
- Talking
- Swallowing
- Bowel & Bladder Function

Key diagnostic findings include:

- Recent onset, within days to at most four weeks of symmetric weakness, usually starting in the legs
- Abnormal sensations such as pain, numbness, and tingling in the feet that accompany or even occur before weakness
- Absent or diminished deep tendon reflexes in weak limbs
- Elevated cerebrospinal fluid protein without elevated cell count. This may take up to 10 days from onset of symptoms to develop.
- Abnormal nerve conduction velocity findings, such as slow signal conduction
- Sometimes, a recent viral infection or diarrhea.

* How is Guillain-Barré syndrome diagnosed?

*How is Guillain-Barré treated?

- There is no known cure for Guillain-Barré syndrome. However, some therapies can lessen the severity of the illness and shorten recovery time.
- Because of possible complications of muscle weakness, problems that can affect any paralyzed person (such as pneumonia or bed sores) and the need for sophisticated medical equipment, individuals with Guillain-Barré syndrome are usually admitted and treated in a hospital's intensive care unit.
- There are currently two treatments commonly used to interrupt immune-related nerve damage. One is plasma exchange (Plasmapheresis); the other is high-dose immunoglobulin therapy .

Rehabilitative care:

- As individuals begin to improve, they are usually transferred from the acute care hospital to a rehabilitation setting. Here, they can regain strength, receive physical rehabilitation and other therapy to resume activities of daily living, and prepare to return to their pre-illness life.
- Occupational and vocational therapy help individuals learn new ways to handle everyday functions that may be affected by the disease, as well as work demands and the need for assistive devices and other adaptive equipment and technology.

Thank you