

PERIPHERAL NERVOUS SYSTEM DISEASES

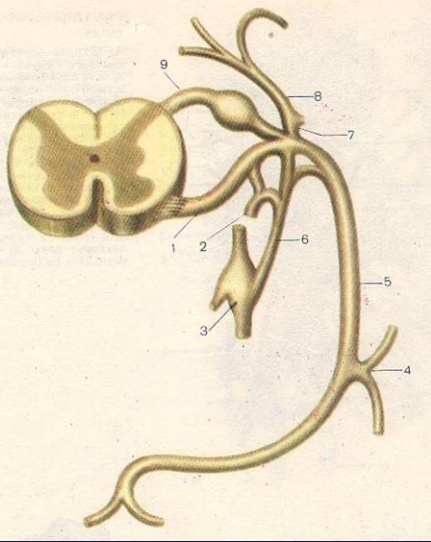
Prof. M. Gavriiuc

Peripheral Nervous System Diseases:

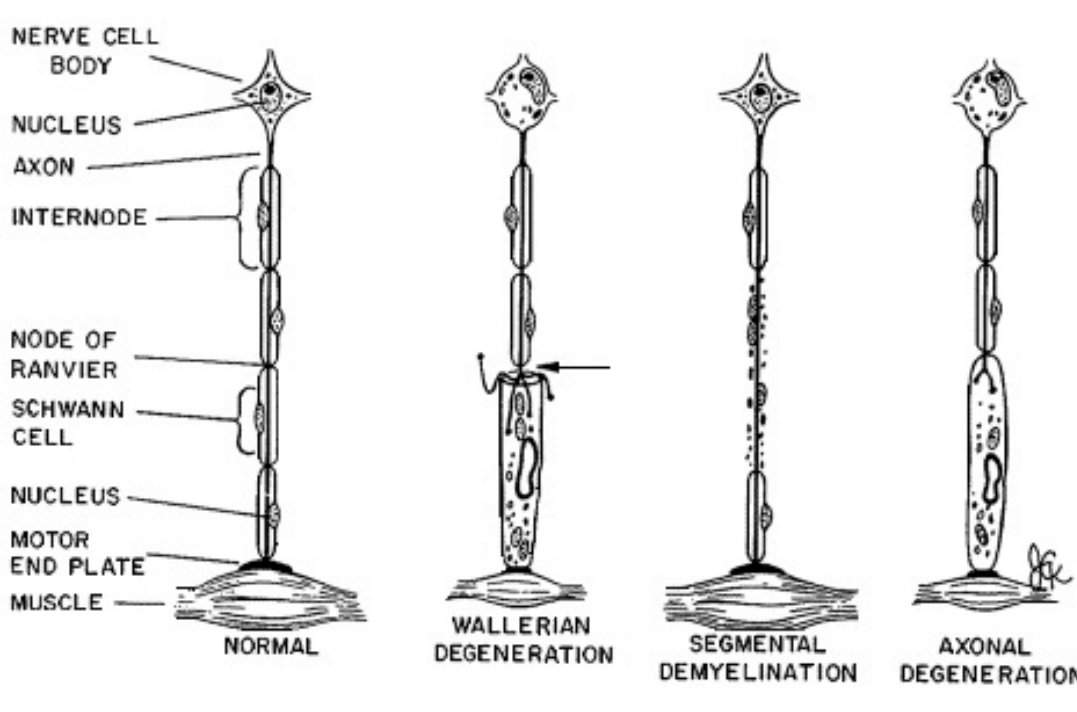
diseases of the peripheral nerves external to the brain and spinal cord, which includes diseases of the nerve roots, ganglia, plexi, autonomic nerves, sensory nerves, and motor nerves.

Peripheral Nervous System Diseases

CLASSIFICATION



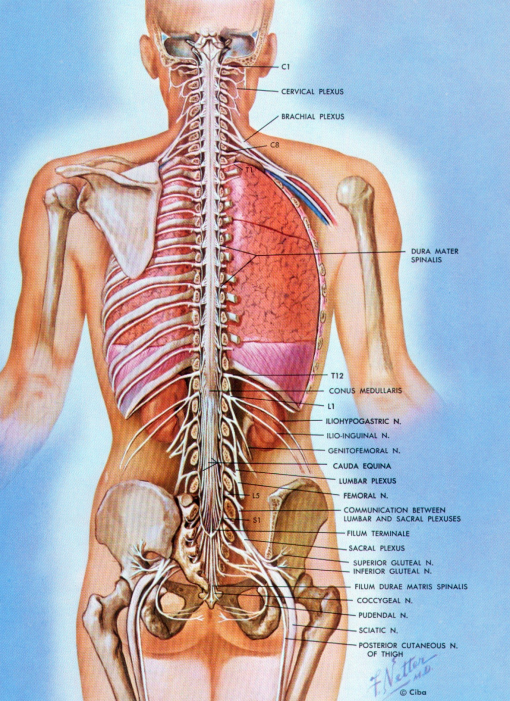
ANATOMICAL SUBSTRATUM	THE NAME OF THE DISEASE
<i>spinal nerve roots</i>	Radiculopathy Radiculitis
<i>intervertebral ganglion</i>	Ganglioneuropathy Ganglionitis Ganglioneuralgy
<i>plexus</i>	Plexitis Plexopathy



Peripheral Nervous System Diseases

CLASSIFICATION

ANATOMICAL SUBSTRATUM	THE NAME OF THE DISEASE
<i>peripheral nerve</i>	Mononeuropathy / mononeuritis Multineuropathy / multineuritis Polyneuropathy / polyneuritis
<i>peripheral nerves and spinal cord roots</i>	Polyradiculoneuropathy Polyradiculoneuritis



Peripheral Nervous System Diseases

CLASSIFICATION

EVOLUTION	ETIOLOGY
<p><i>acute</i></p> <p><i>subacute</i></p> <p><i>chronic</i></p>	<p>Degenerative diseases of the spinal column</p> <p>Trauma</p> <p>Infections</p> <p>Ischemia</p> <p>Neoplasm</p> <p>Intoxication</p>

Peripheral Nervous System Diseases

ETIOLOGY

Disorders can result from damage to or dysfunction of the cell body, myelin sheath, axons, or neuromuscular junction. Disorders can be genetic or acquired (due to toxic, metabolic, traumatic, infectious, or inflammatory conditions).

Some Causes of Peripheral Nervous System Disorders

Site	Type	Examples
Nerve root	Hereditary	Neurofibroma
	Acquired	Herniated disk, infections, metastatic cancer, spinal foraminal stenosis, trauma
Plexus	Acquired	Acute brachial neuritis, diabetes mellitus, hematoma, local tumors (e.g., schwannoma), metastatic cancer, neurofibromatosis (rare), traction during birth, severe trauma
Peripheral nerve	Entrapment	Carpal tunnel syndrome, cubital tunnel syndrome, radial nerve palsy, peroneal nerve palsy, tarsal tunnel syndrome, ulnar nerve palsy
	Hereditary	Hereditary adult-onset neuropathies, hereditary sensory and motor neuropathies, hereditary sensory and autonomic neuropathies
	Infectious	Hepatitis C, herpes zoster, HIV infection, Lyme disease, syphilis In developing nations: Diphtheria, leprosy, parasite infections
	Inflammatory	Chronic inflammatory demyelinating polyradiculoneuropathy, Guillain-Barré syndrome and variants
	Ischemic	Femoral nerve infarction (diabetic amyotrophy), vasculitis causing multiple mononeuropathy (mononeuritis multiplex)
	Toxic-metabolic	Amyloidosis, diabetes mellitus, dysproteinemic neuropathy, chronic excessive alcohol consumption with undernutrition (particularly deficiency of B vitamins), ICU neuropathy, leukodystrophies (rare), renal insufficiency, toxins (eg, arsenic, lead, thallium, chemotherapy drugs, pyridoxine toxicity)
Neuro-muscular junction	----	Botulism in infants, congenital myasthenia (very rare), Eaton-Lambert syndrome, myasthenia gravis, toxic or drug-induced neuromuscular junction dysfunction (eg, due to exposure to insecticides or nerve gas, abnormally high Mg levels, or use of neuromuscular blockers)

Peripheral Nervous System Diseases

Clinical evaluation

History should focus on type of symptom, onset, progression, and location, as well as information about potential causes (e.g., family history, toxic exposures, past medical disorders).

Peripheral Nervous System Diseases

Clinical evaluation: Neurologic Examination

Sensory loss syndromes

Peripheral:

- mononeural
- multilineal
- plexal
- polineural

Segmental:

- ganglional
- radicular

Lower motor neuron syndrome:

- muscle hypo- or atrophy
- fasciculations
- muscle hypo- or atonia
- Hypo- or areflexia

Peripheral Nervous System Diseases

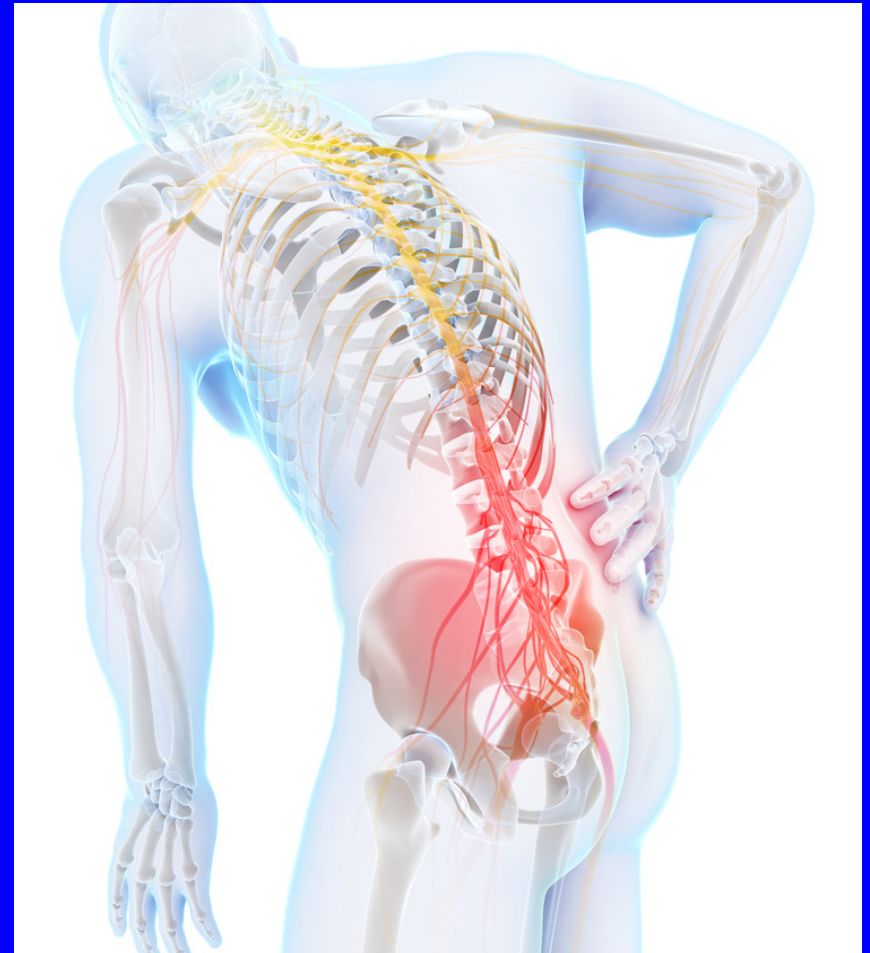
TESTING

- Nerve conduction studies and electromyography (electrodiagnostic testing)
- nerve biopsy
- Genetic testing
- MRI
- Ultrasound

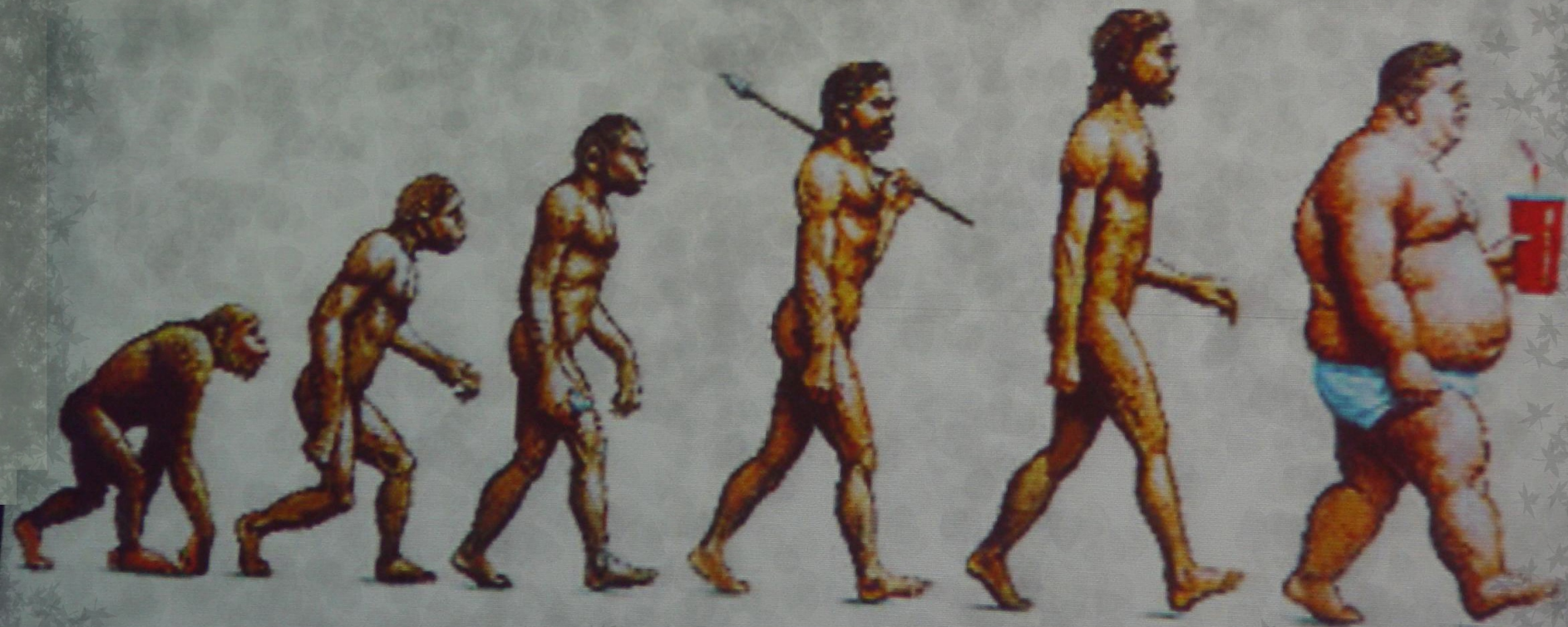
Peripheral Nervous System Diseases

BACK PAIN

Back pain is one of the most common reasons people go to the doctor or miss work and a leading cause of disability worldwide. Most people have back pain at least once.



Background



Who is imperfect?

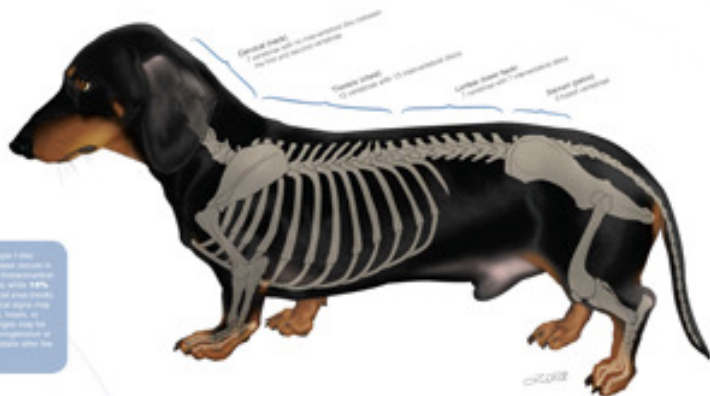
Canine Intervertebral Disc Disease

Intervertebral disc disease is a degeneration and protrusion of the intervertebral discs, shock absorbers for the spine column. This results in compression of the spinal cord, spinal nerves, and/or nerve roots. It is the most common cause of spinal cord disease in dogs.

Disc disease is one of the most common neurological problems seen in dogs. Other names for this problem include slipped disc, ruptured disc, herniated disc, and prolapsed disc.

The prevalence of disc disease in dogs varies by breed. In a study of 100 dogs, 85% of dogs with disc disease were found to have a vertebral defect. The most common vertebral defects were found in the lumbar and sacral regions. The most common vertebral defects were found in the lumbar and sacral regions. The most common vertebral defects were found in the lumbar and sacral regions.

85% of dogs with disc disease have a vertebral defect. The most common vertebral defects were found in the lumbar and sacral regions. The most common vertebral defects were found in the lumbar and sacral regions.



Type 1 (Hemorrhagic)

The disc nucleus is displaced and ruptured, causing a hemorrhage. This type of disc disease is most common in the thoracic and lumbar regions.

Type 2 (Fibrocartilaginous)

The disc nucleus is displaced and ruptured, causing a fibrocartilaginous extrusion. This type of disc disease is most common in the lumbar and sacral regions.

Type 3 (Calcified)

The disc nucleus is displaced and ruptured, causing a calcified extrusion. This type of disc disease is most common in the lumbar and sacral regions.

Thanks to the Spinal Cord

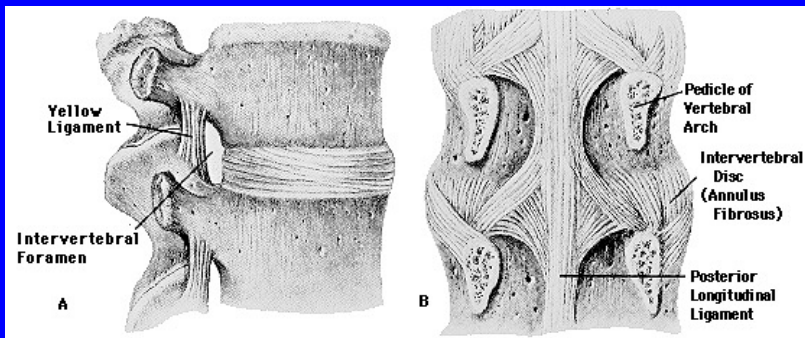
The spine acts as a conduit to carry neural impulses throughout the body. It is made up of vertebrae and intervertebral discs. The spine is made up of vertebrae and intervertebral discs. The spine is made up of vertebrae and intervertebral discs.

Clinical Signs of Spinal Damage and Treatment Options

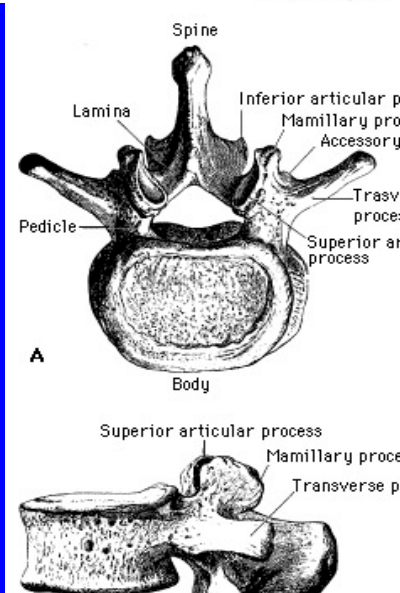
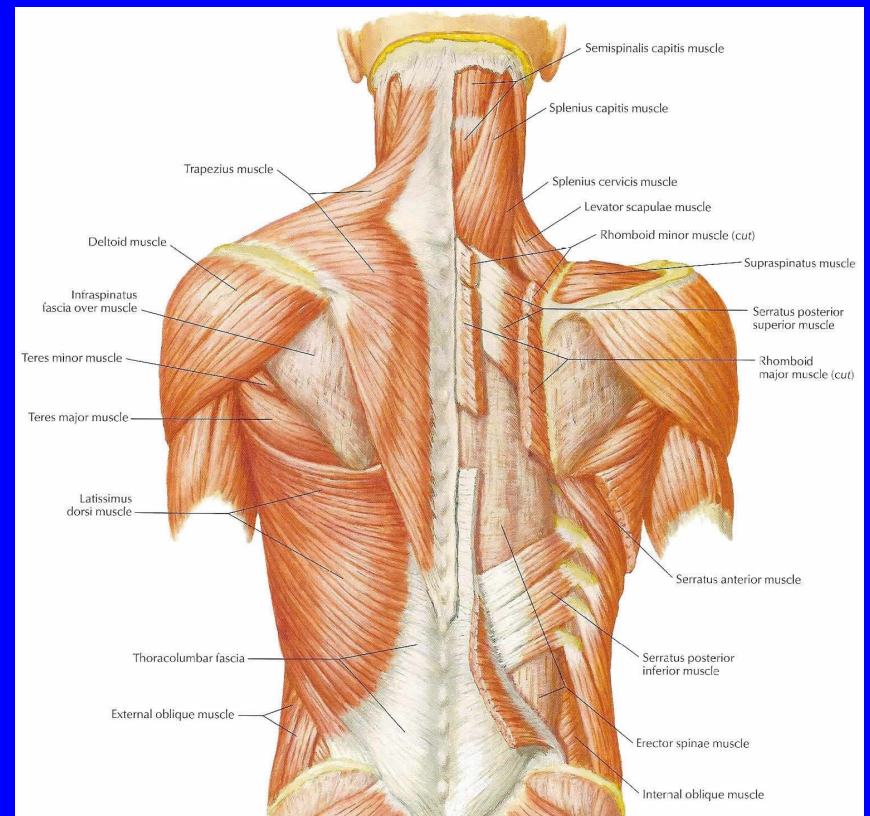
Signs	Treatment Options	Prognosis
<ul style="list-style-type: none"> • Pain • Weakness • Paralysis • Incontinence • Loss of reflexes 	<ul style="list-style-type: none"> • Rest • Pain relief • Physical therapy • Surgery 	<ul style="list-style-type: none"> • Good • Fair • Poor • Guarded • Poor

The stability of the spine depends on the integrity of the vertebral bodies and intervertebral discs and on two types of supporting structures,

the ligamentous (passive)



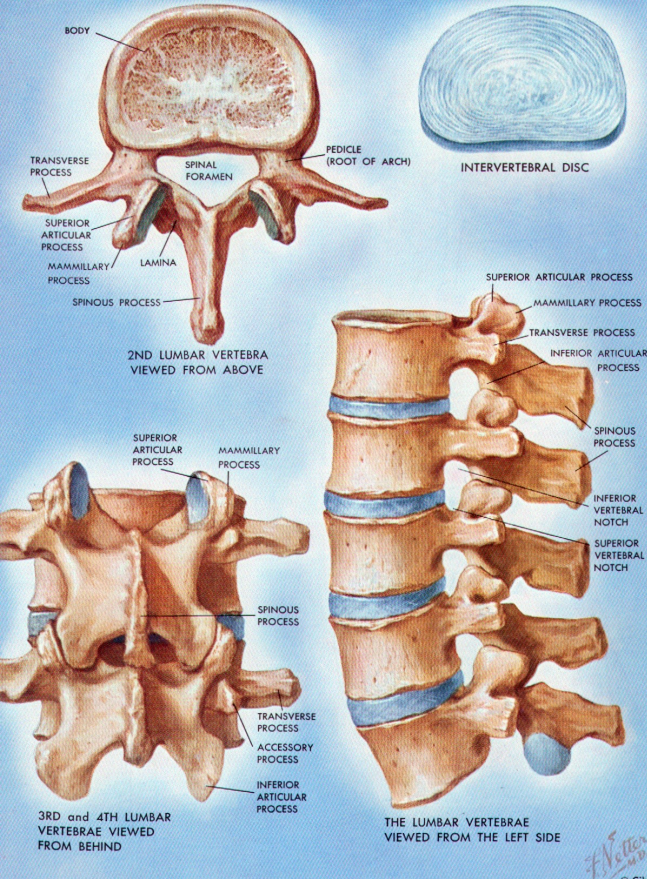
and muscular (active)



Peripheral Nervous System Diseases

Peripheral Nervous System Diseases

HERNIATION of LUMBAR INTERVERTEBRAL DISCS

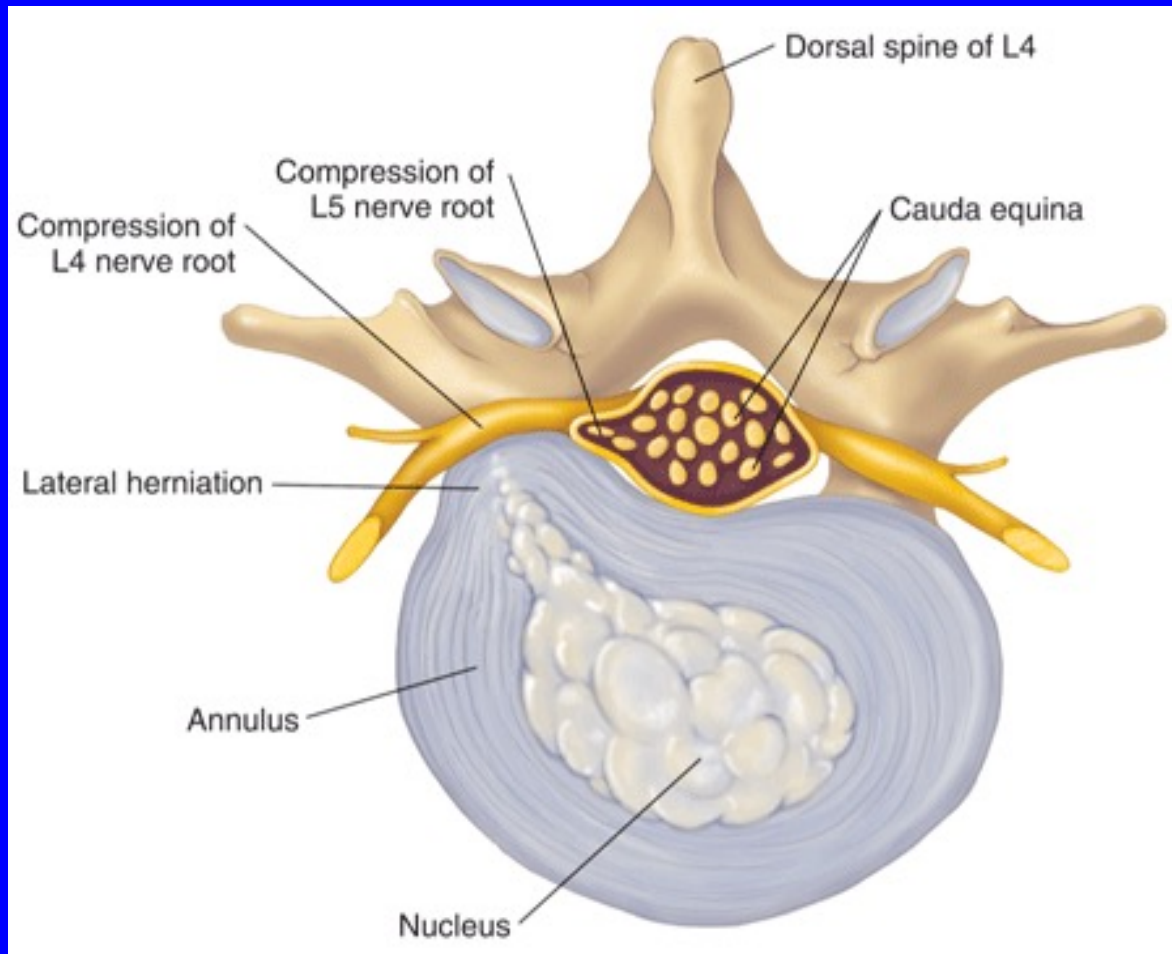


Changes in the intervertebral discs and ligaments as a consequence of aging and perhaps a succession of minor traumas begin to occur as early as the first part of the third decade.

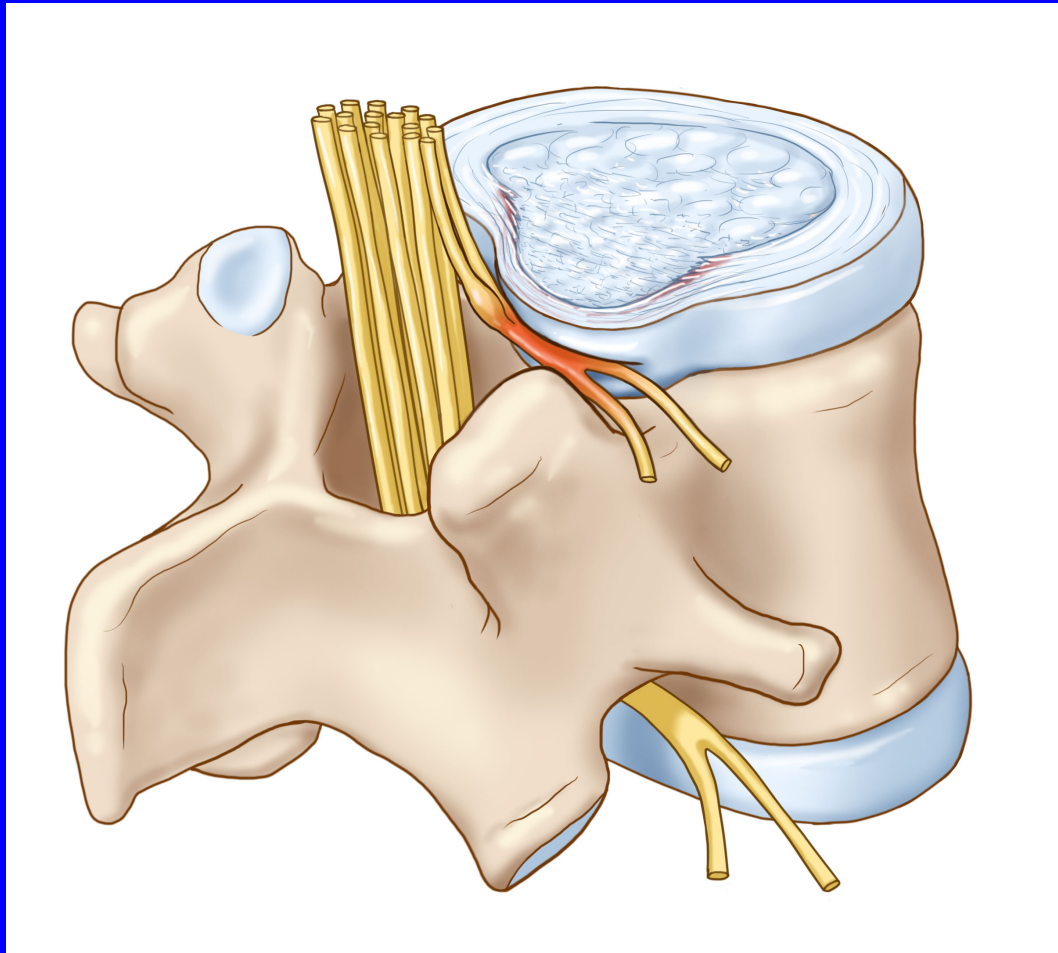
Deposition of collagen and elastin and alterations of glycosamino-glycans combine to decrease the water content of

the nucleus pulposus; concomitantly the cartilagenous end plate becomes less vascular. The dehydrated disc thins out and becomes more fragile. Similar changes occur in the annulus of the disc, which frays to an increasing degree with the passage of time, permitting the nucleus pulposus to bulge and, sometimes with injury, to extrude.

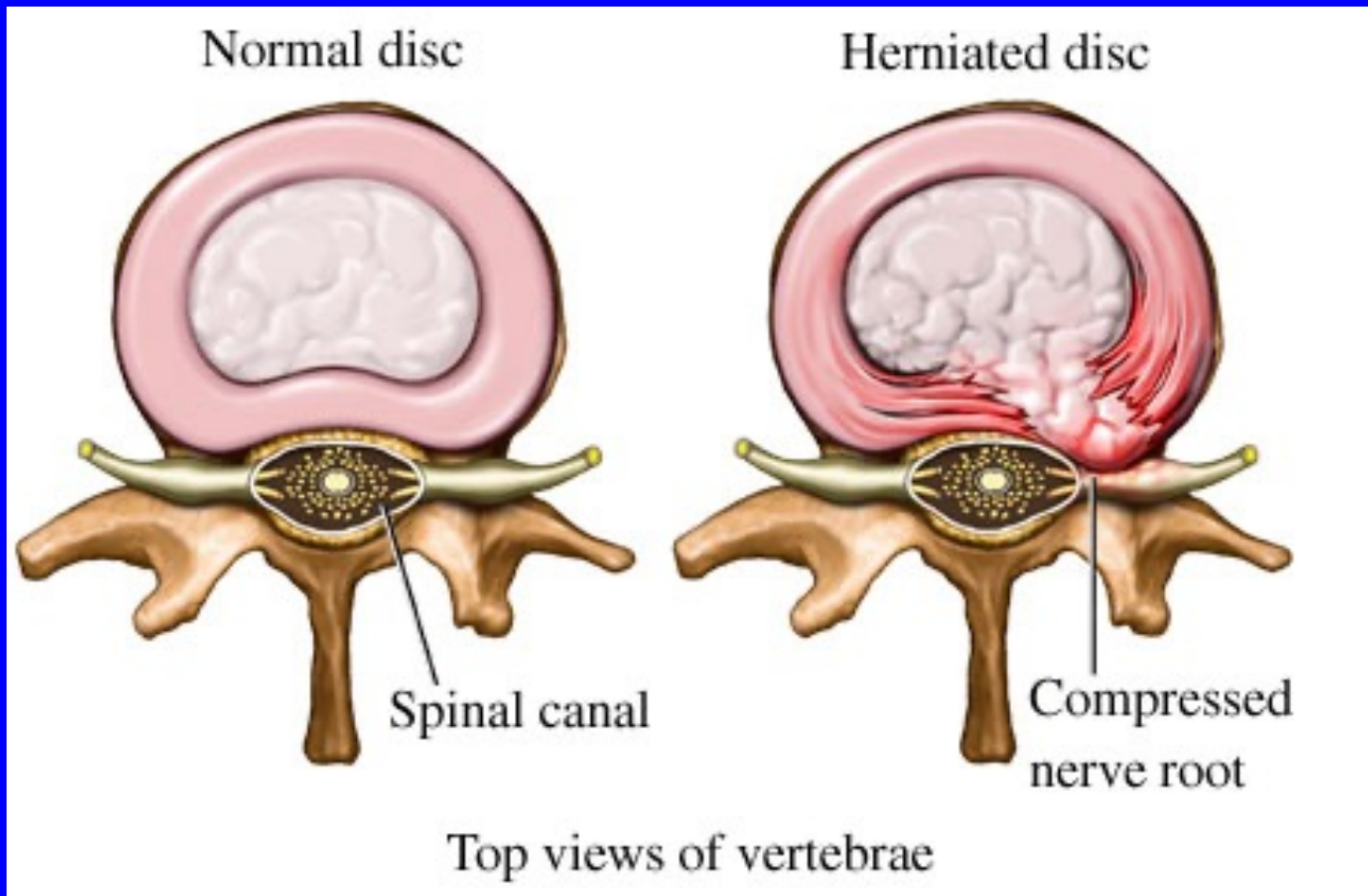
PROLAPSE



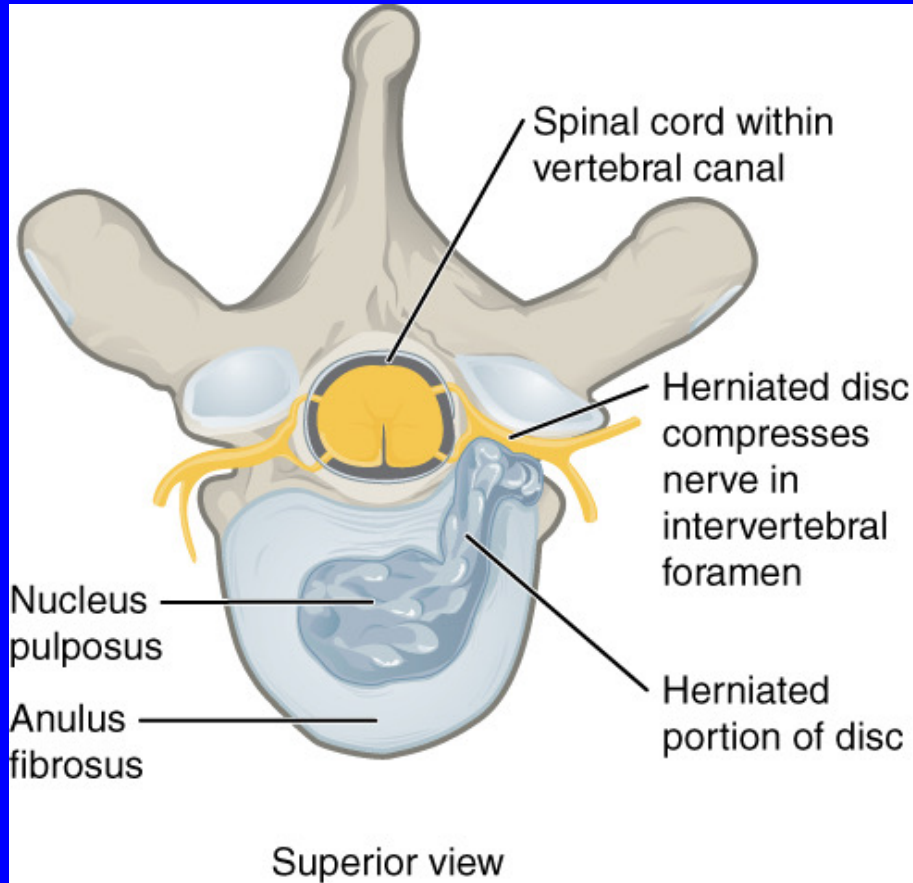
IRRITATION: aseptic inflammation

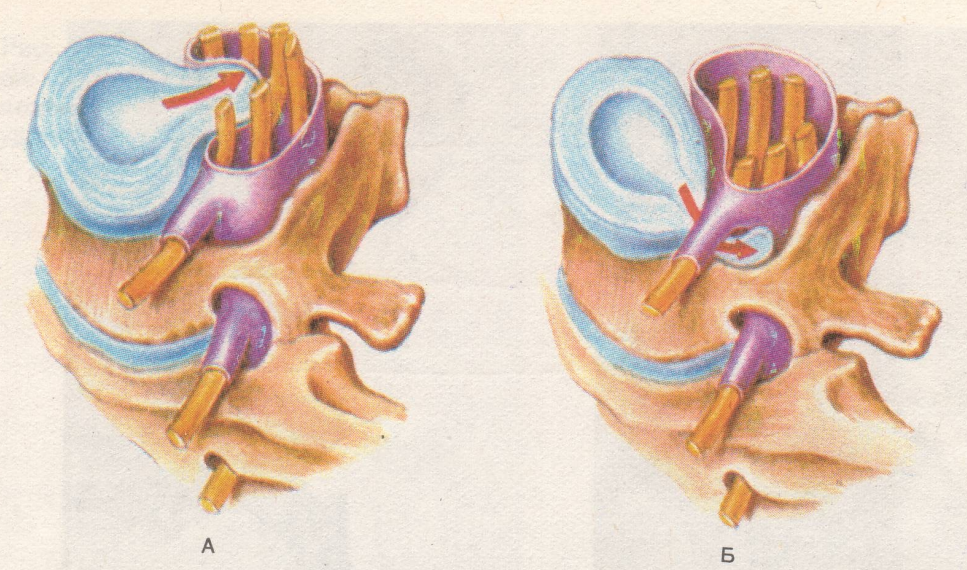


COMPRESSION



PARALYSIS



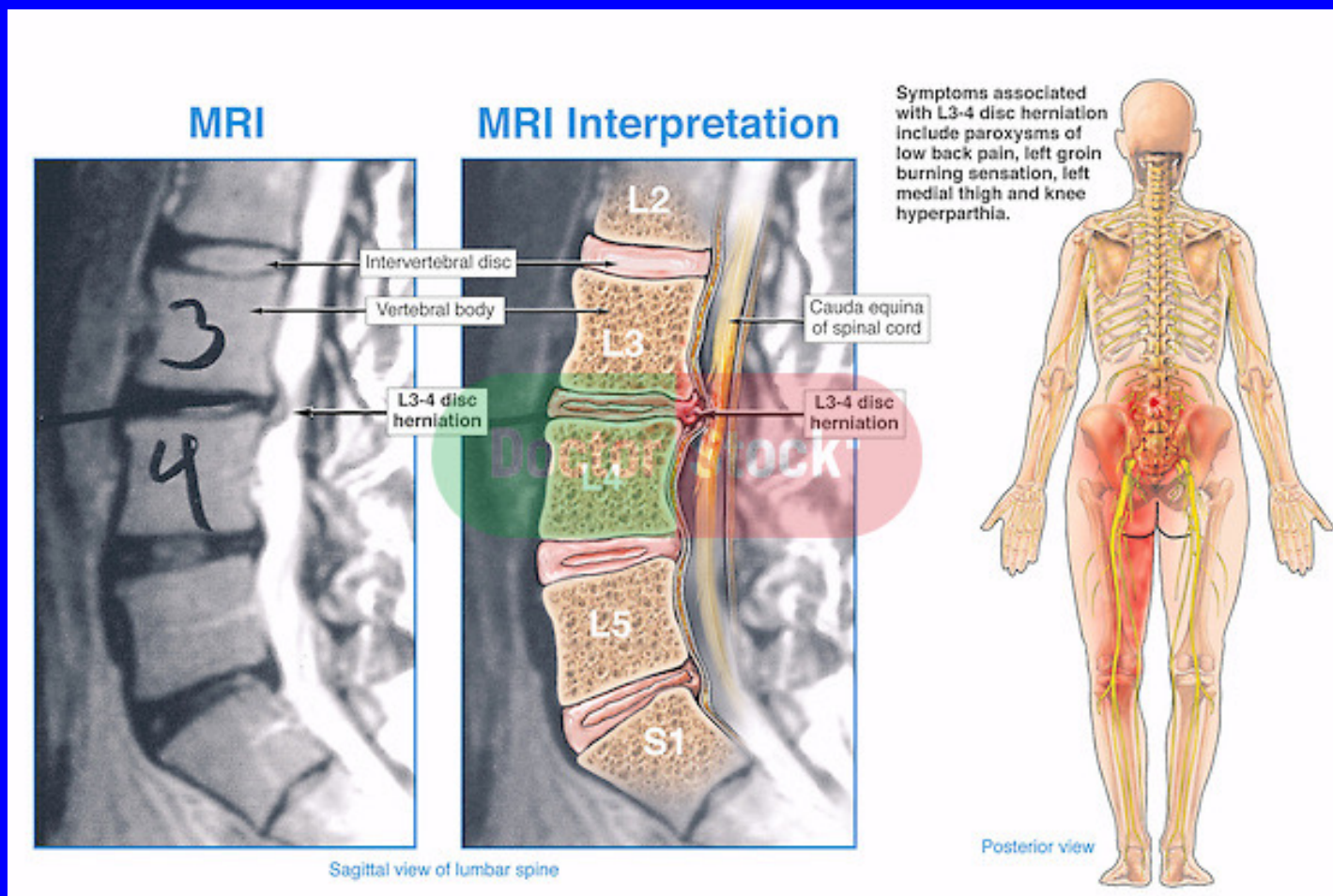


**Peripheral Nervous System
Diseases**
**HERNIATION of LUMBAR
INTERVERTEBRAL DISCS**

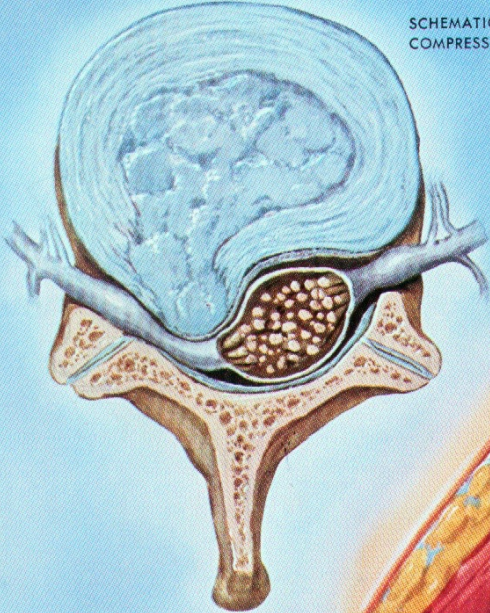
Radicular, or "root," pain is sharp, often intense, and usually radiates from a central position near the spine to some part of the lower limb. Coughing, sneezing, and straining characteristically evoke this sharp radiating pain. Involvement of L4, L5, and S1 roots, which form the sciatic nerve, causes pain that extends down the posterior aspects of the thigh and the postero- and anterolateral aspects of the leg, into the foot - so-called sciatica.

Peripheral Nervous System Diseases

ROOT PAIN



SCHEMATIC CROSS-SECTION SHOWING
COMPRESSION OF NERVE ROOT



Peripheral Nervous System Diseases

HERNIATION of LUMBAR INTERVERTEBRAL DISCS

*There are four
fluctuating phases of the
clinical syndrome of
herniated intervertebral
discs. The size and
position of the herniation
at each phase determine
the clinical picture.*



NUCLEUS
PULPOSUS

NERVE ROOT

DURA

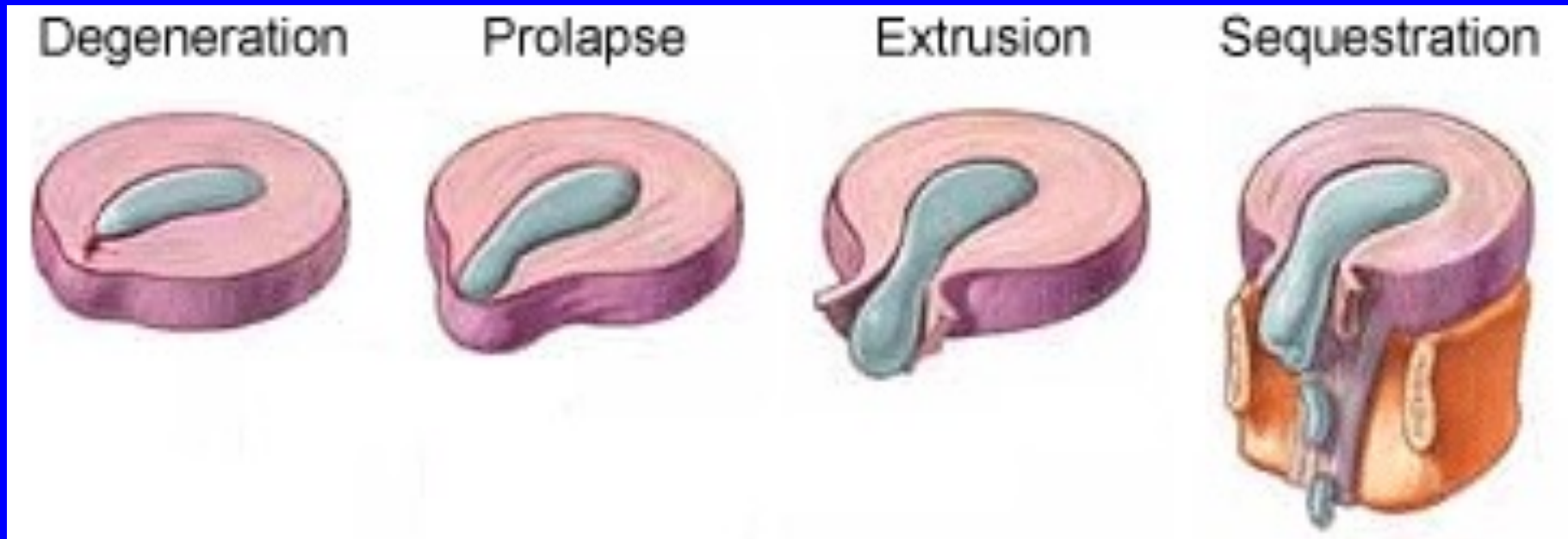
SURGICAL EXPOSURE OF LOWER LUMBAR HERNIATION

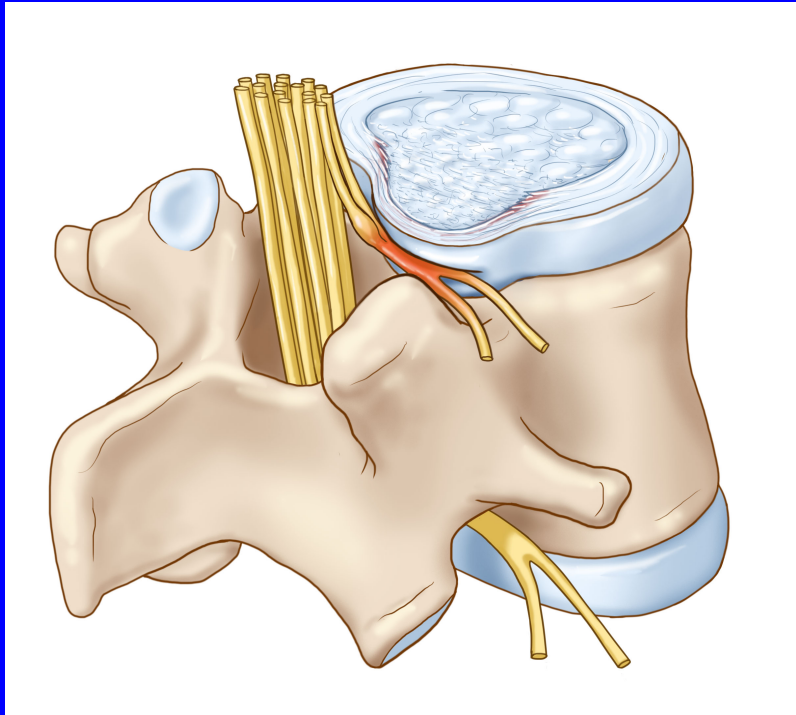
CHARACTERISTIC POSTURE
IN LEFT-SIDED, LOWER
LUMBAR DISC HERNIATION

F. Netter
M.D.
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Peripheral Nervous System Diseases

Four stages to a disc herniation



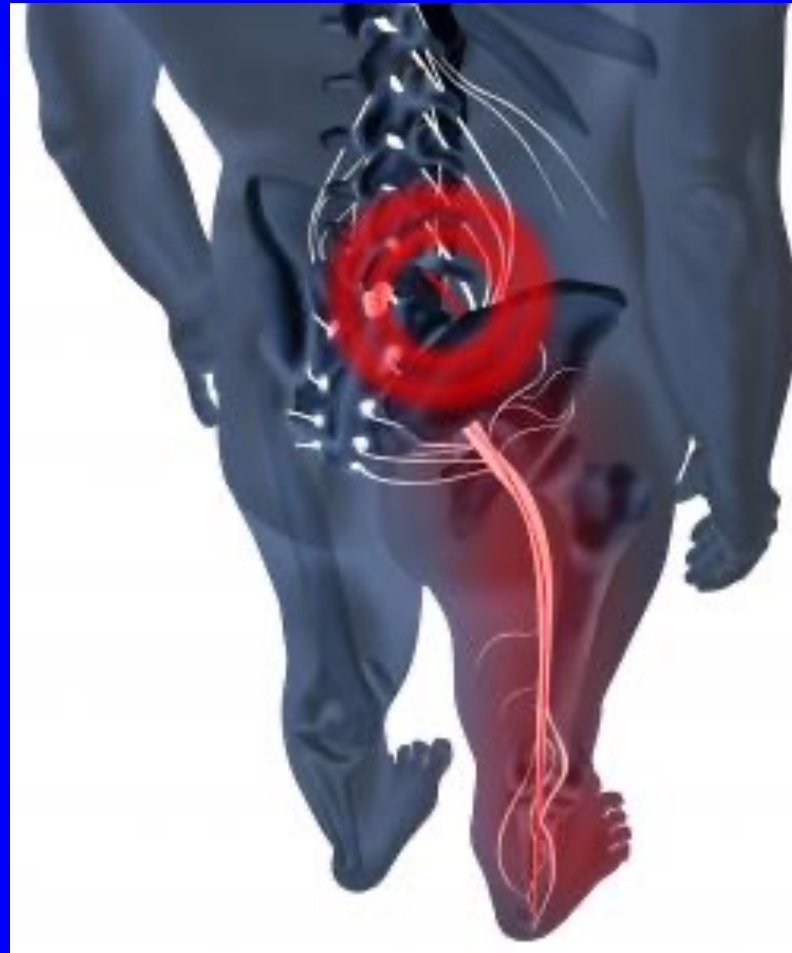


Peripheral Nervous System Diseases

HERNIATION of LUMBAR INTERVERTEBRAL DISCS

1. Irritation. *Back pain with or without sciatic radiation is the most outstanding symptom. The clinical findings include a diminution in lumbar curve, spasm of the spinae erecti muscles, a tilt of the trunk and partial disability. If not further protrusion takes place, bed rest with a board under the mattress, local heat, light massage and traction result in subsidence of symptoms.*

IRRITATION



Peripheral Nervous System Diseases

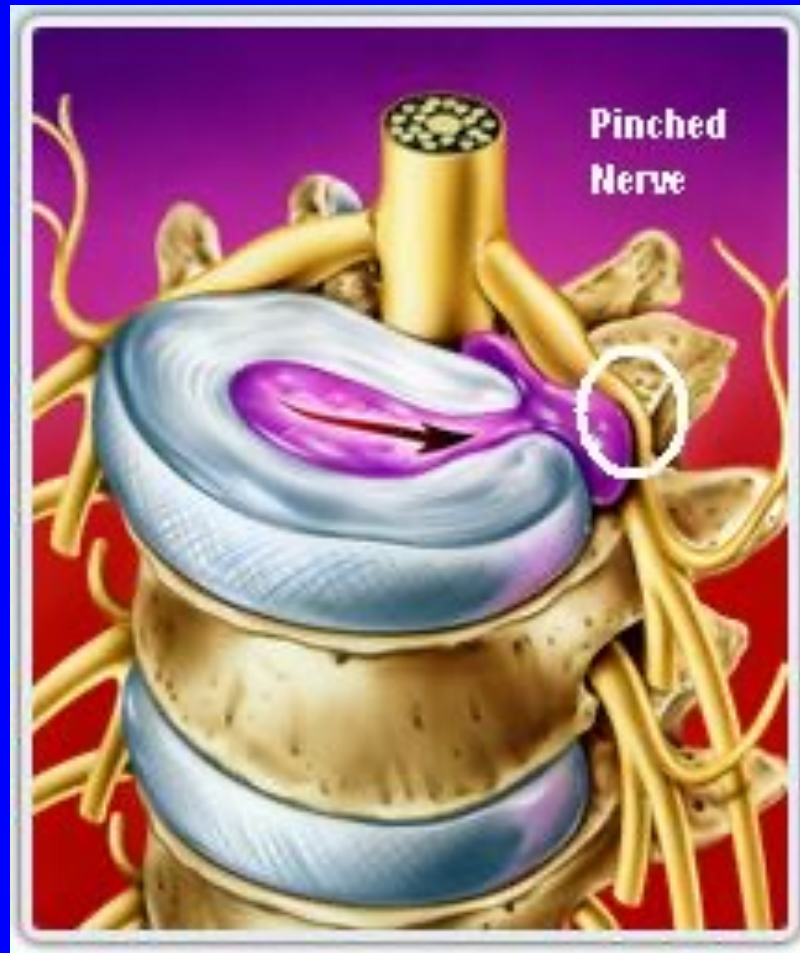
HERNIATION of LUMBAR INTERVERTEBRAL DISCS

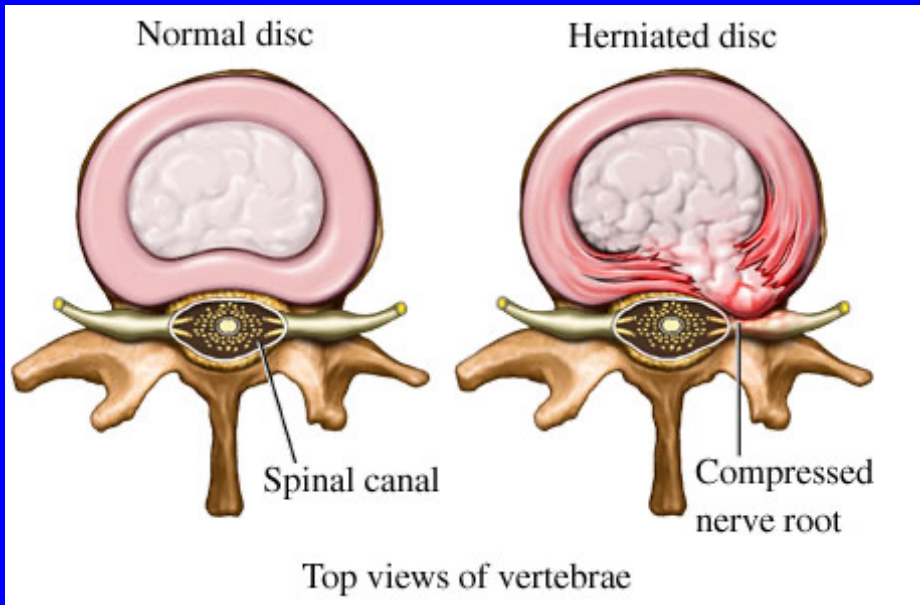


2. Compression. *The herniated disc displaces and compresses the adjacent nerve root against the neighboring bony and ligamentous structures. The back pain may lessen but the “sciatic” pain may*

*become intense and is usually aggravated by coughing, sneezing, or increased activity. Paresthesias in the outer aspect of the calf, foot or toes are frequent symptoms. The positive findings are loss of lumbar curve, spasm of lumbar muscle, tilt of the trunk, focal tenderness, limitation of straight leg raising and **Lasegue’s sign** on the involved side, mild, indistinct hypalgesia over the outer calf and absent to diminished ankle jerk.*

COMPRESSION





DISEASES OF THE PERIPHERAL NERVOUS SYSTEM

HERNIATION of LUMBAR INTERVERTEBRAL DISCS

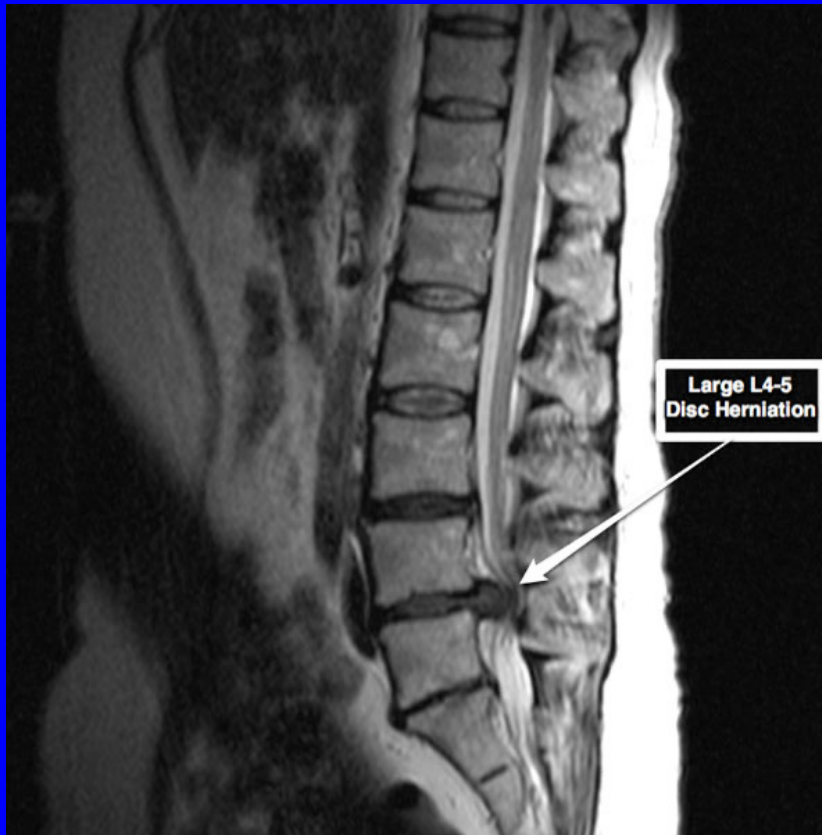
3. Paresis. At this stage, root compression has intensified the pain so that the patient is almost totally disabled. The findings include weakness of the lower extremity, muscle atrophy, peroneal palsy, **demonstrable sensory deficit**, and diminished to absent knee or ankle jerk.

PARESIS



DISEASES OF THE PERIPHERAL NERVOUS SYSTEM

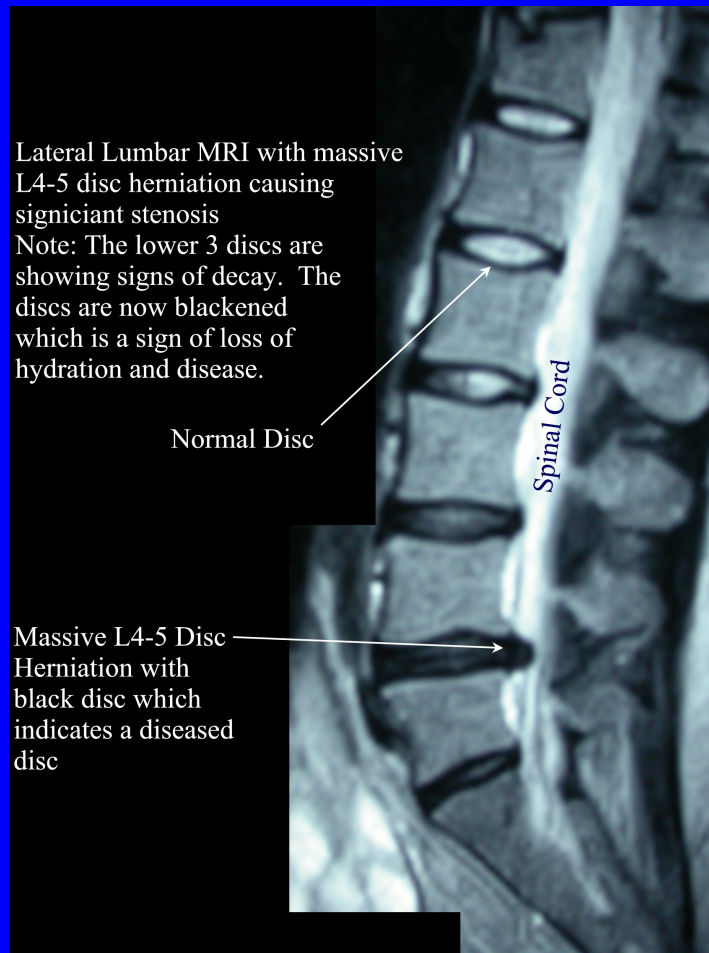
HERNIATION of LUMBAR INTERVERTEBRAL DISCS



4. Paralysis.

*The sequestered disc may be so large and so critically situated that it behaves like a neoplasm compressing the roots of the cauda equina, resulting in **paralysis of the lower extremities**, marked sensory loss and disturbance of function of bladder and bowel.*

MASSIVE HERNIATION



PARALYSIS

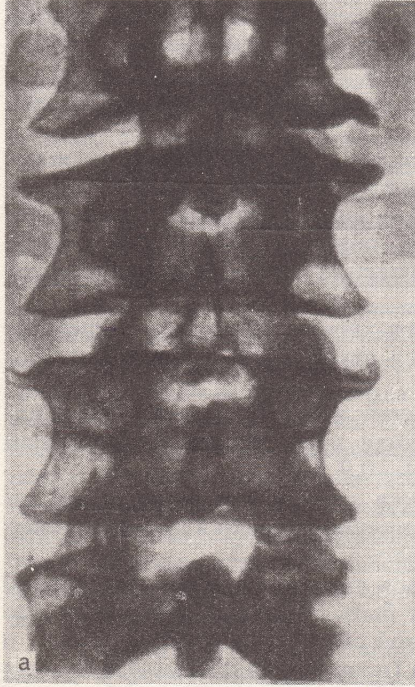


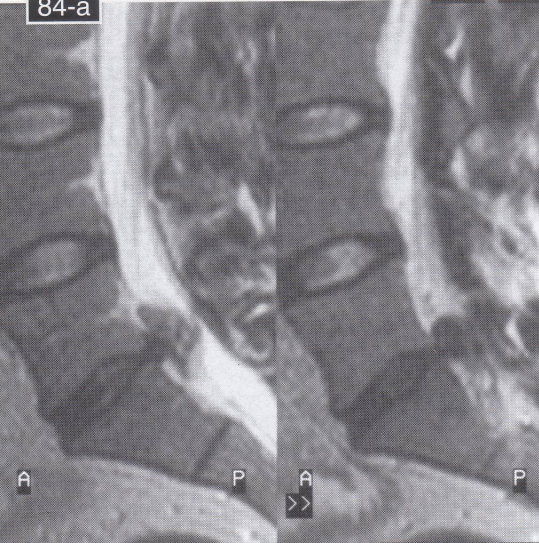
HERNIATION of LUMBAR INTERVERTEBRAL DISCS

Ancillary Diagnostic Procedures

Radiographs

of the lumbar spine (preferably with the patient standing) in the anteroposterior, lateral, and oblique planes are still useful in the routine evaluation of low-back pain and sciatica. Readily demonstrable in plain films are **narrowing of the intervertebral disc spaces**, bony facetar or vertebral overgrowth, displacement of vertebral bodies (spondylolisthesis), and an unsuspected infiltration of bone by cancer.

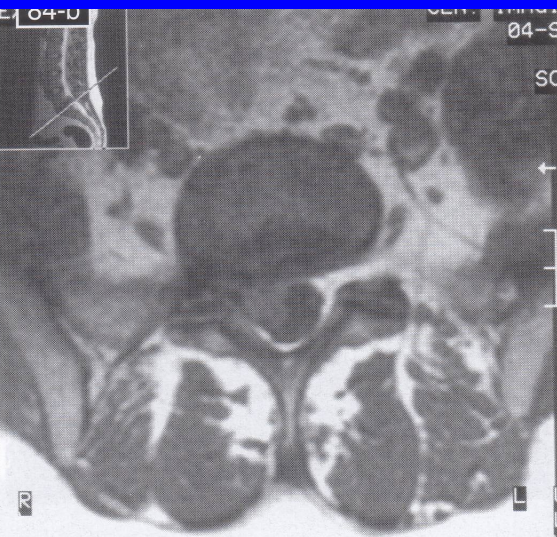




HERNIATION of LUMBAR INTERVERTEBRAL DISCS

Ancillary Diagnostic Procedures

In cases of suspected disc herniation or tumor infiltration of the spinal canal, one proceeds directly to CT or **MRI**. Although these imaging procedures have largely replaced conventional myelography, the latter examination, when combined with CT, provides detailed information about the dural sleeves that surround the spinal roots, at times disclosing subtle truncations caused by laterally situated **disc herniations** and revealing surface abnormalities of the spinal cord, such as arteriovenous malformations. Administration of gadolinium at the time of MRI enhances regions of inflammation and tumor.

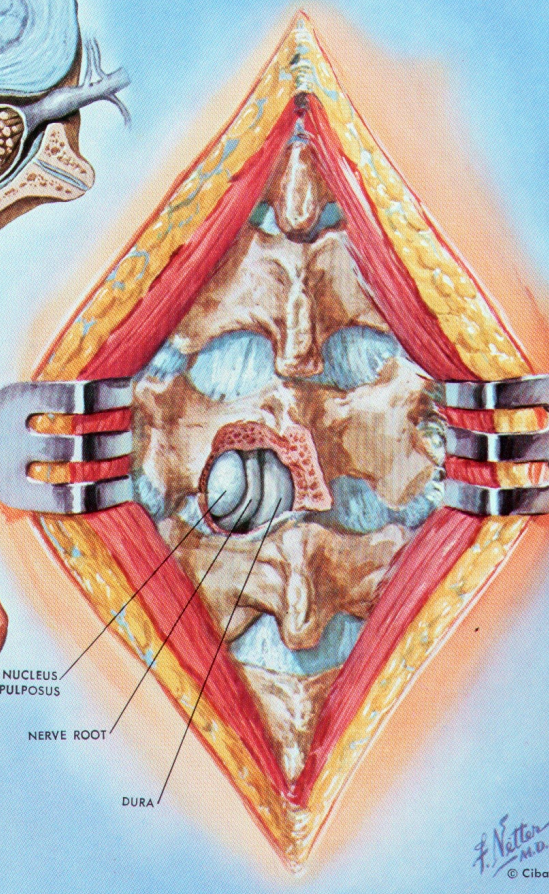


HERNIATION of LUMBAR INTERVERTEBRAL DISCS

Treatment

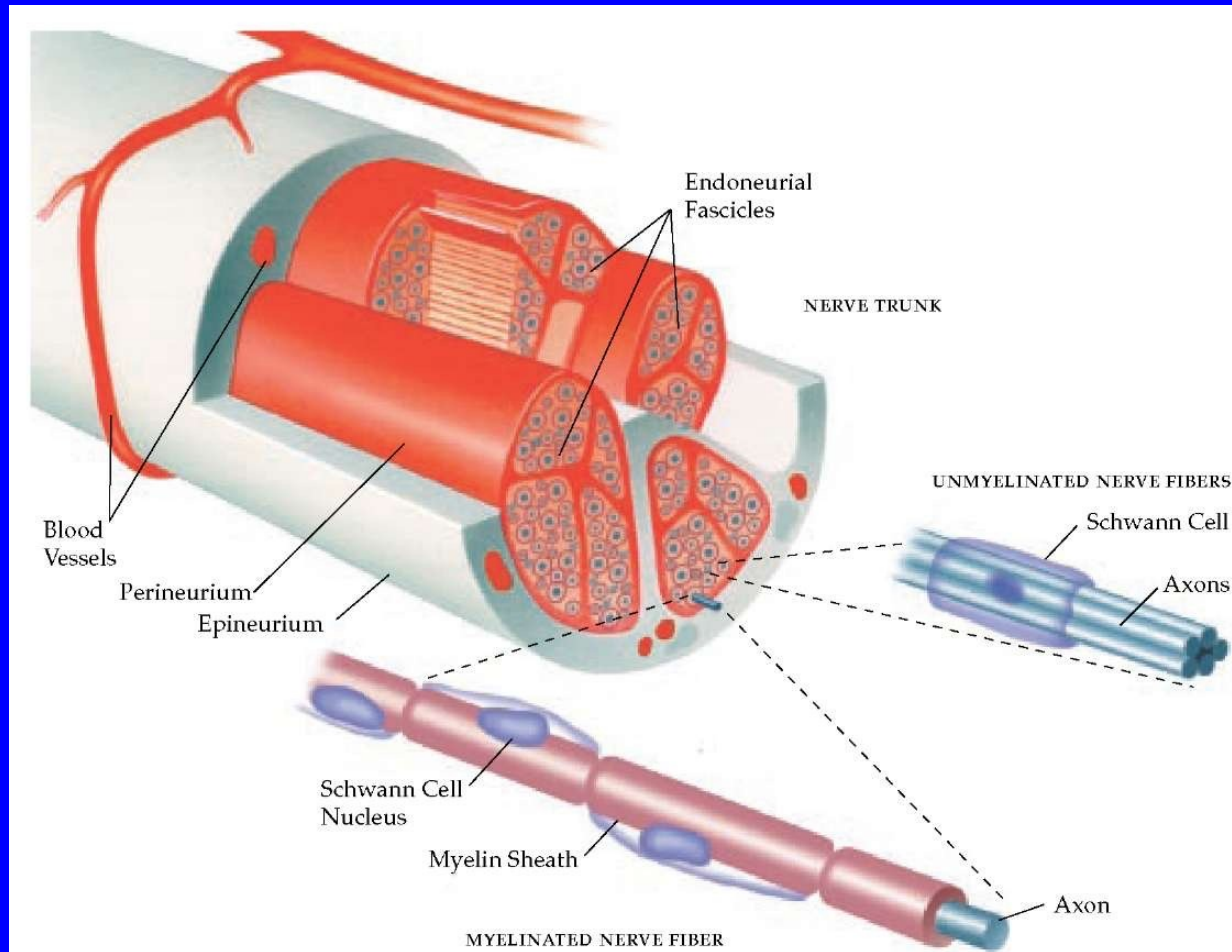
The basic principle of therapy is rest, in a recumbent position, for several days. Usually lying on the side with knees and hips flexed is the favored position. This position is best maintained by having the patient lie with a small pillow or folded blanket under the lumbar portion of the spine or lie face down. Nonsteroidal anti-inflammatory medication should be given liberally during the first few days. Spinal manipulation

practiced by chiropractors, osteopaths and others may be useful. Skeletal traction may be of considerable benefit. If the pain and neurologic findings do not subside in response to this type of conservative management or the patient suffers frequent disabling acute episodes, surgical treatment must be considered (interlaminar operation, as illustrated).



Peripheral Nerves' Disorders

PLEXOPATHY, MONONEUROPATHY, AND MULTIPLE MONONEUROPATHIES



Peripheral Nervous System Diseases

PLEXOPATHY, MONONEUROPATHY, AND MULTIPLE MONONEUROPATHIES

Brachial Plexus Neuropathies.

Lesions of the Whole Plexus

Paralyzed

and

side; the

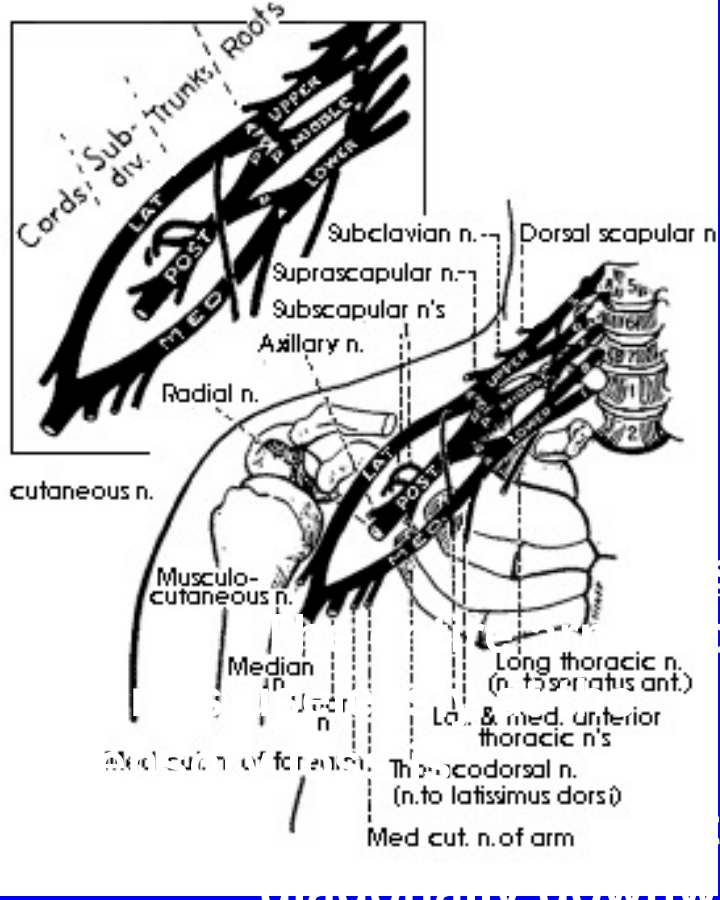
complete below a line

extending from the shoulder

diagonally downward and medially to the middle third of the upper arm. Biceps, triceps, radial periosteal, and finger reflexes are abolished.

Upper Brachial Plexus Paralysis The muscles affected are

the biceps, deltoid, brachialis anticus, supinator longus, supraspinatus and infraspinatus, and rhomboids. The arm hangs at the side, internally rotated and extended at the elbow. Movements of the hand and forearm are unaffected.



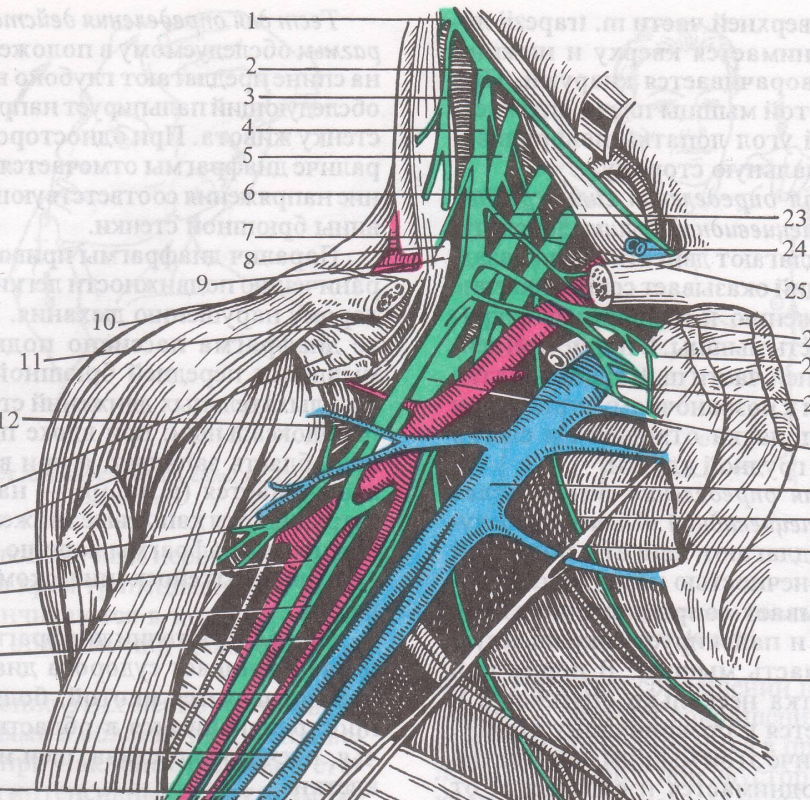
Peripheral Nervous System Diseases

Brachial Plexus Neuropathies

Lower Brachial Plexus Paralysis

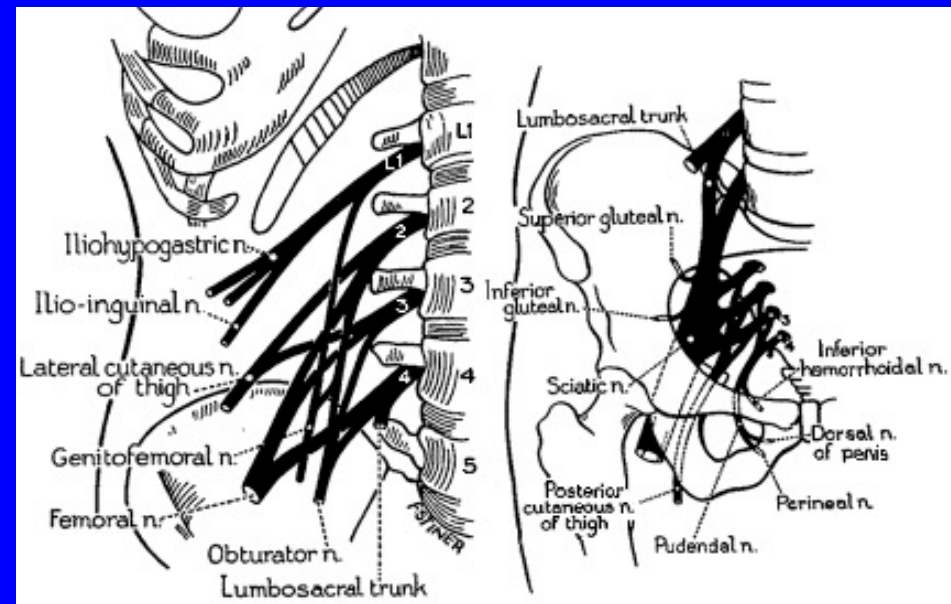
This is usually the result of traction on the abducted arm in a fall or during an operation on the axilla, infiltration or compression by tumors arising from the apex of the lung (superior sulcus or

Pancoast syndrome), or compression by cervical ribs or bands. Injury may occur during birth, particularly with breech deliveries (Dejerine-Klumpke paralysis). There is weakness and wasting of the small muscles of the hand and a characteristic claw-hand deformity. Sensory loss is limited to the ulnar border of the hand and the inner forearm; if the first thoracic motor root is involved, there may be an associated paralysis of the cervical sympathetic nerves with a Horner syndrome.



Peripheral Nervous System Diseases

Lumbosacral Plexus Neuropathies



The main effects of upper adduction of the thigh and sensory loss over the anterior

must be distinguished from the symptoms of femoral neuropathy.

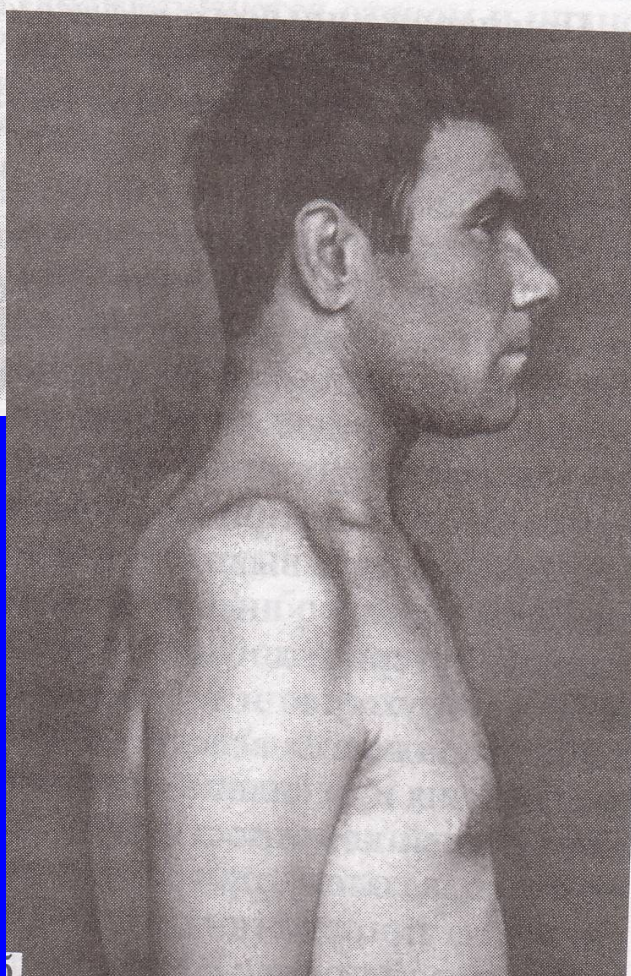
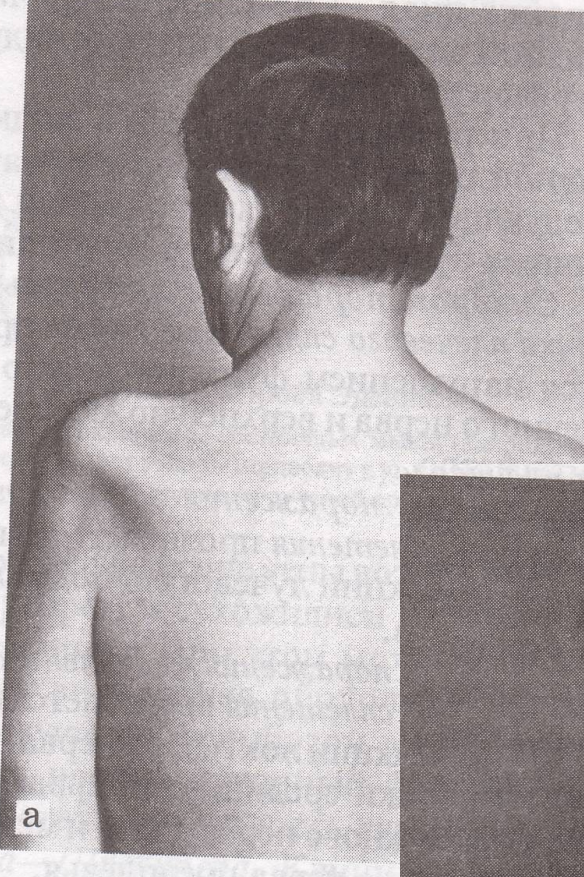
Lower plexus lesions weaken the posterior thigh, leg, and foot muscles and abolish sensation over the first and second sacral segments (sometimes the lower sacral segments also). Lesions of the entire plexus, which occur infrequently, cause a weakness or paralysis of all leg muscles, with atrophy, areflexia, anesthesia from the toes to the perianal region, and autonomic loss with warm, dry skin. Usually there is edema of the leg as well.

lesions are weakness of and extension of the leg, with thigh and leg; these effects

Peripheral Nervous System Diseases

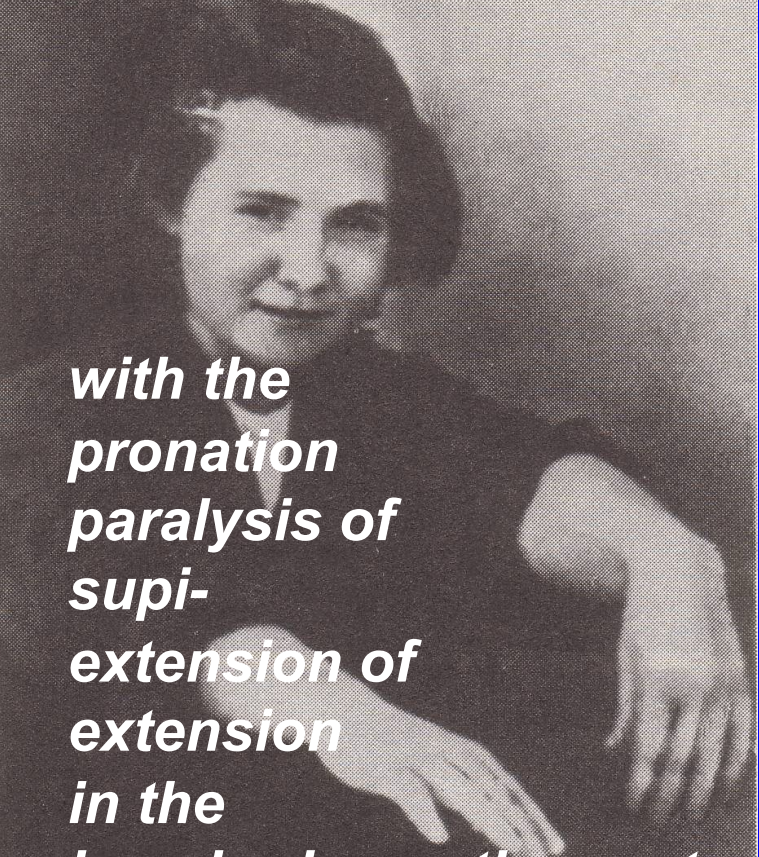
Peripheral Nerves' Disorders

There are a number of motor, sensory, reflex, autonomic, and trophic symptoms and signs that are more or less typical of peripheral nerve disease. Grouping them into syndromes has proved to be of value in clinical diagnosis.



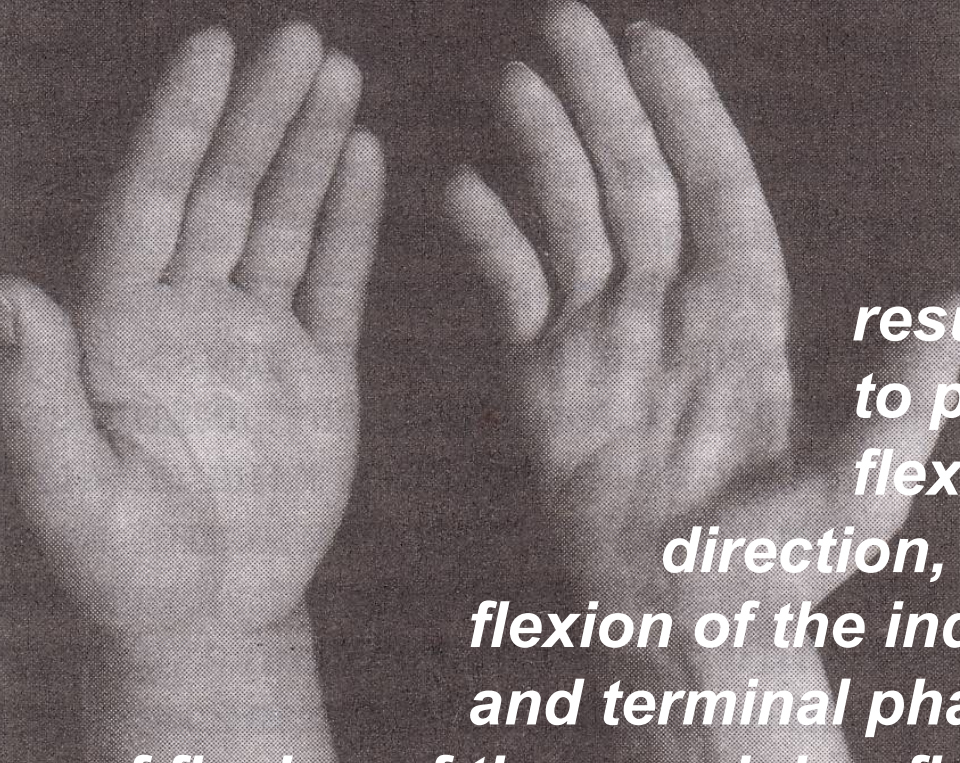
Peripheral Nervous System Diseases

Radial Nerve. Paralysis of extension of the elbow, flexion of the elbow forearm midway between and supination (due to the brachioradialis muscle), pronation of the forearm, the wrist and fingers, and abduction of the thumb plane of the palm. Sensation is



with the pronation paralysis of supination extension of extension in the

impaired over the posterior aspects of the forearm and over a small area on the radial aspect of the dorsum of the hand. The nerve may be compressed in the axilla ("crutch palsy") but more frequently at a lower point, where the nerve winds around the humerus; pressure palsies incurred during an alcoholic stupor and fractures of the humerus commonly injure the nerve at the latter site.



Peripheral Nervous System Diseases

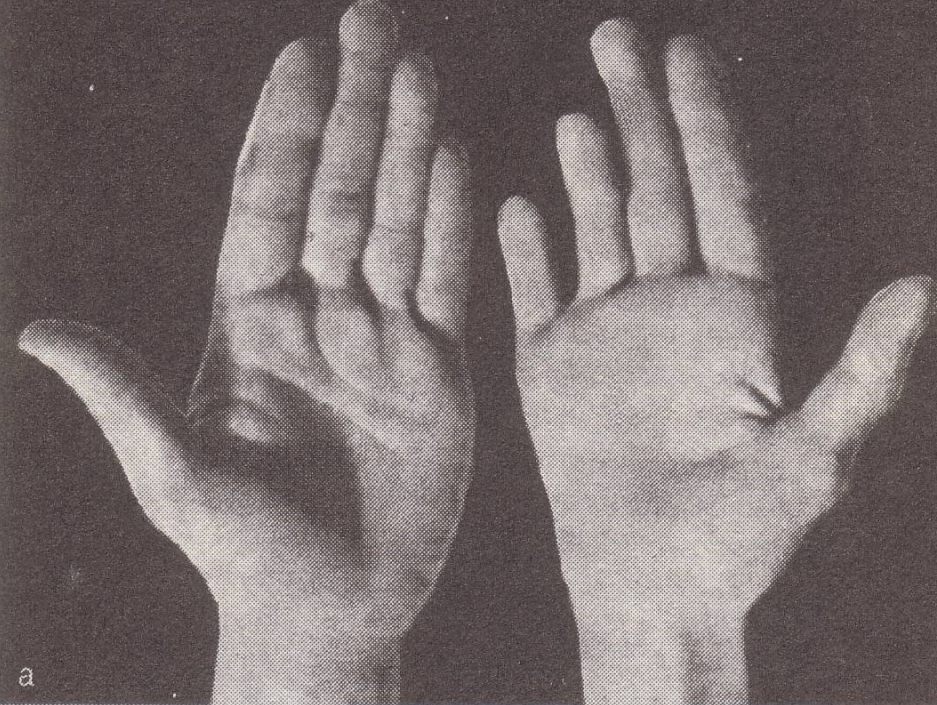
Median Nerve Inability

results in the impossibility to pronate the forearm or flex the hand in a radial direction, paralysis of flexion of the index finger and terminal phalanx of the thumb, weakness of flexion of the remaining fingers, weakness of opposition and abduction of the thumb in the plane at a right angle to the palm (abductor and flexor pollicis brevis), and sensory impairment over the radial two-thirds of the palmar aspect of the hand and the dorsum of the distal phalanges of the index and third fingers.

Peripheral Nervous System Diseases

Ulnar nerve impairment.

Characteristic claw-hand deformity; wasting of the small hand muscles results in hyperextension of the fingers at the metacarpophalangeal joints and flexion at the interphalangeal joints. The flexion deformity is most pronounced in the fourth and fifth fingers, since the lumbrical muscles of the second and third fingers, supplied by the median nerve, counteract the deformity. Sensory loss occurs over the fifth finger, the ulnar aspect of the fourth finger, the ulnar border of the palm.



ENTRAPMENT (tunnel) syndromes

Nerve entrapment syndromes result from chronic injury to a nerve as it travels through an osseoligamentous tunnel; the compression is typically between the ligamentous canal and bony surfaces.



ENTRAPMENT (tunnel) syndromes

- **Carpal tunnel syndrome**, compression of the median nerve at the wrist, is the most common entrapment neuropathy.
- **Cubital tunnel syndrome** is the second most common and is caused by a compression at the elbow.
- Other: *suprascapular nerve; Meralgia paresthetica, Ulnar nerve compression at the wrist (Guyon canal); radial nerve in the proximal forearm - posterior interosseous nerve syndrome; Suprascapular nerve entrapment; Common peroneal nerve entrapment; Tarsal tunnel syndrome*

ENTRAPMENT (tunnel) syndromes

The symptoms of nerve compression vary based on the particular nerve involved. In general, however, the temporal sequence of neurological manifestations is as follows:

- **Irritative or inflammation** (sensory nerves): pain, paresthesia
- **Ablative symptoms**: numbness (sensory nerves), weakness and atrophy (motor nerves)

ENTRAPMENT (tunnel) syndromes

In a major mixed nerve (both sensory and motor), such as the sciatic or median nerves, signs of sympathetically mediated features may be prominent in chronic cases. These changes manifest as the following:

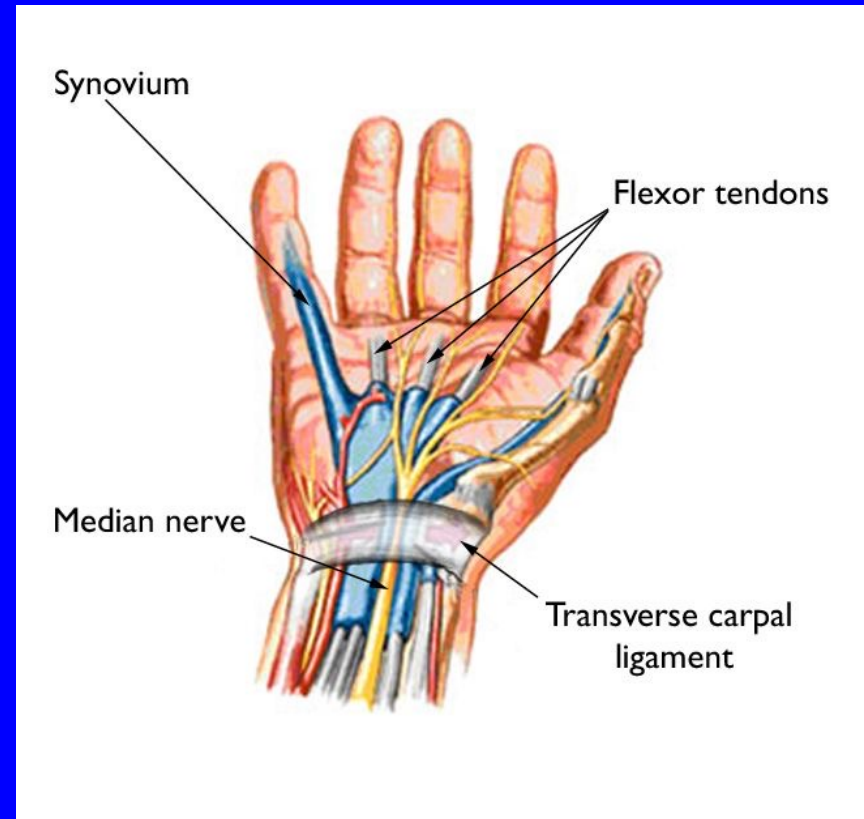
- Dry, thin, hairless skin
- Ridged, thickened, cracked nails
- Recurrent skin ulcerations

Carpal tunnel syndrome (CTS)

- Carpal tunnel syndrome is the most commonly encountered nerve entrapment condition.
- Median nerve compression at the wrist is at the transverse carpal ligament (TCL).
- Patients note a dull, aching pain at the wrist that may extend up the forearm to the elbow. Often, it is associated with distressing paresthesias in the thumb and index finger, particularly upon awakening.

Carpal tunnel syndrome (CTS)

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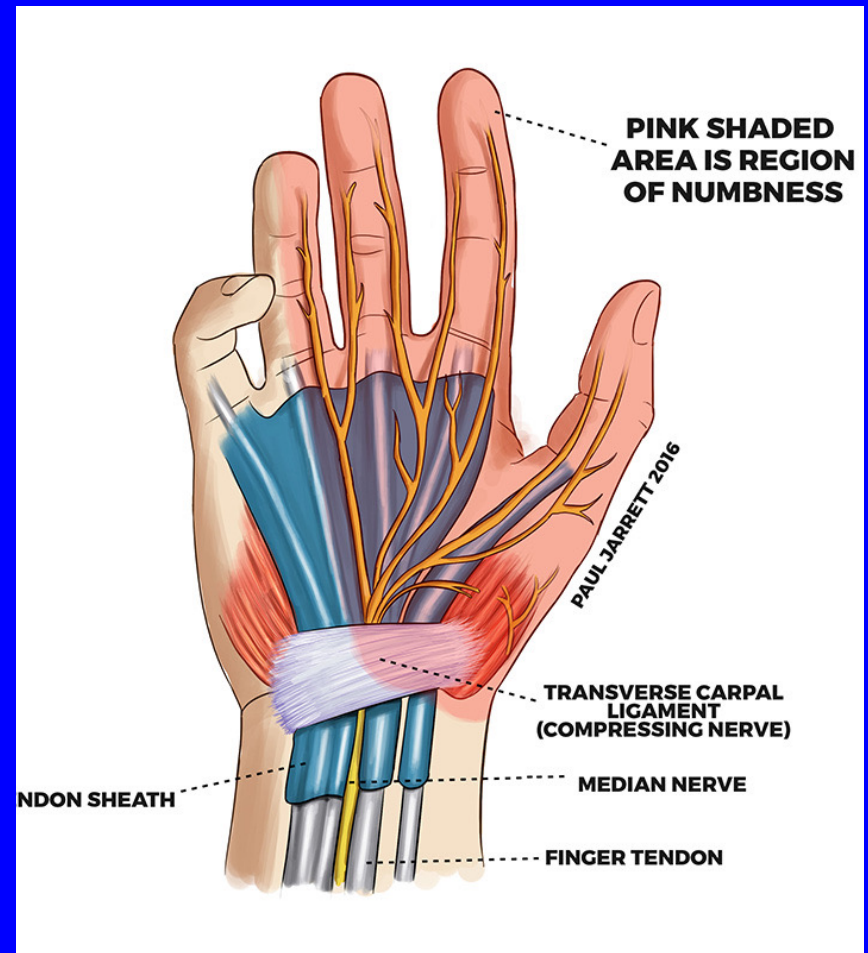
Carpal tunnel syndrome (CTS)

Typically, patients rub their wrists or shake their hands to try to "get the blood back into their wrists." The pain is typically worse at night and disturbs their sleep.



Carpal tunnel syndrome (CTS)

Sensation in the palmar surface of the lateral 3.5 fingers is often affected;



Carpal tunnel syndrome (CTS)

In more chronic or severe cases, weakness in the hand or atrophy may be present.



Complementary examinations in entrapment (tunnel) syndromes

- Electrodiagnostic studies;
- Vascular laboratory studies, including Doppler ultrasonography combined with provocative maneuvers;
- MRI/MRA;
- and, rarely, angiography.

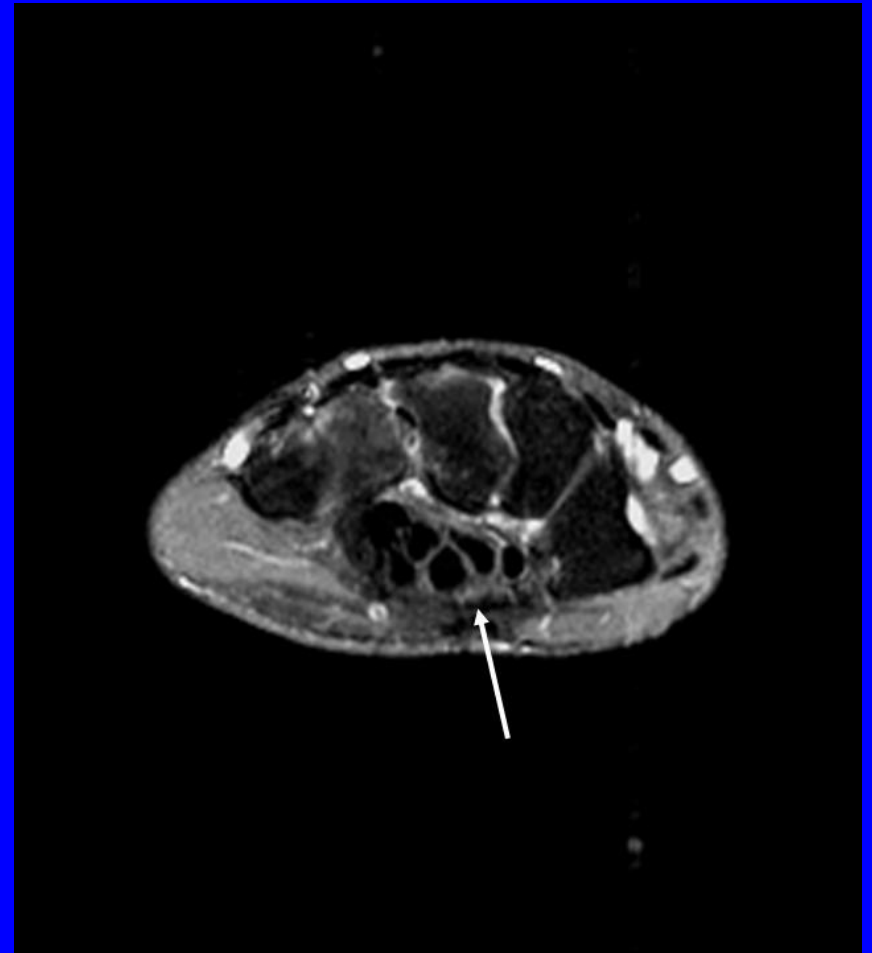
Complementary examinations in entrapment (tunnel) syndromes

Electrodiagnostic tests provide useful information: confirming the clinical diagnosis and localization, grading the lesion, identifying an underlying or superimposed peripheral neuropathy, and distinguishing other entities.

Additionally, a baseline electrodiagnostic study may allow comparison to a postoperative study in patients with persistent symptoms.

Complementary examinations in entrapment (tunnel) syndromes

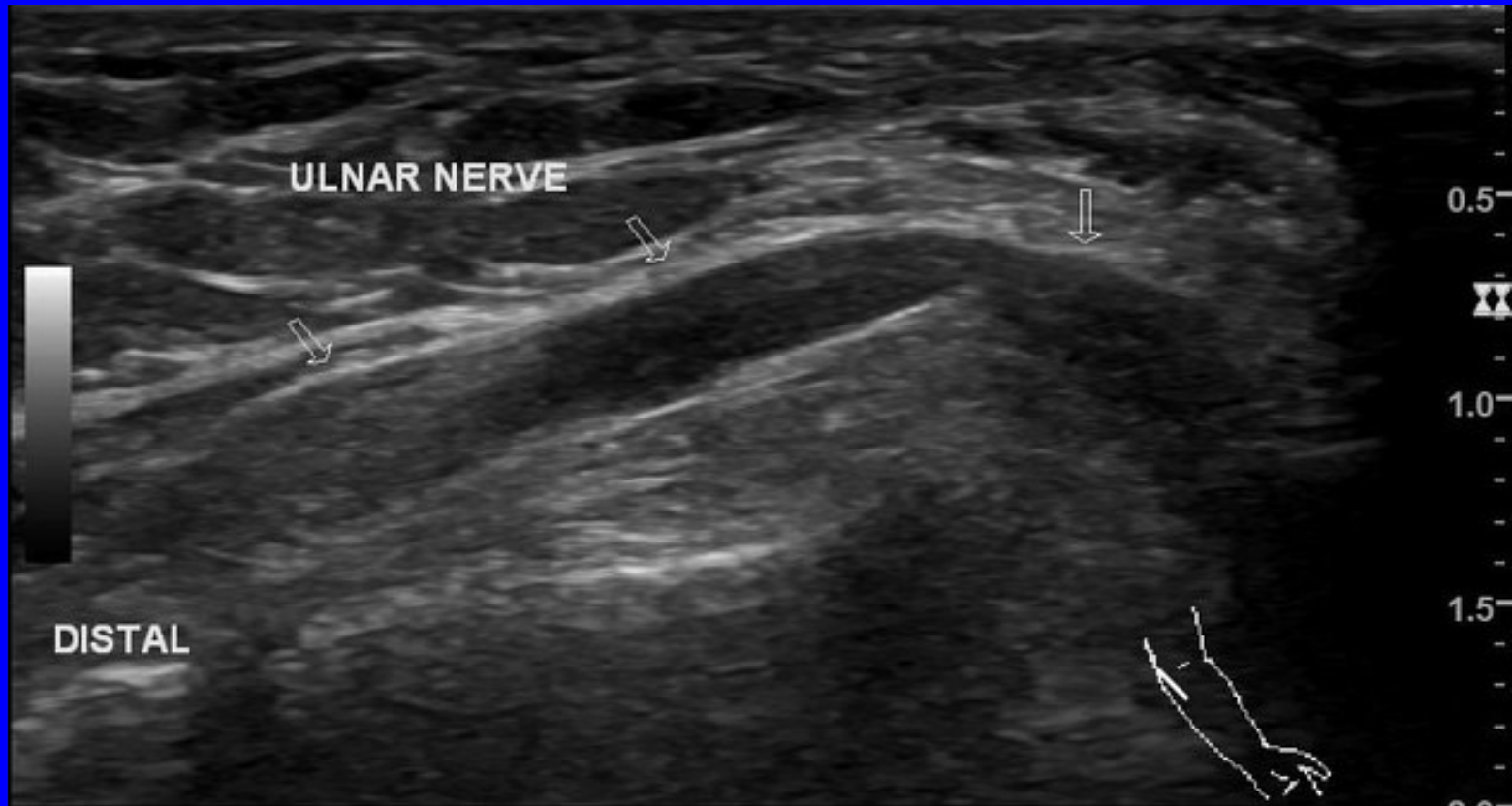
Magnetic resonance imaging (MRI) using the short inversion imaging recovery technique displays high signal intensity in the affected nerve segment at the site of the compression.



Carpal tunnel syndrome on MRI

Complementary examinations in entrapment (tunnel) syndromes

- Doppler ultrasonography combined with provocative maneuvers;



Treatment of entrapment (tunnel) syndromes

- Medical Therapy
- Conservative measures should be tried first in most cases of entrapment neuropathy. Meralgia paresthetica secondary to pregnancy and obesity and intrapartum median nerve compression at the wrist may become completely asymptomatic after delivery or weight loss.

Treatment of entrapment (tunnel) syndromes

- Medical Therapy
- Compression neuropathies secondary to systemic disease, such as thyroid disease and autoimmune conditions, may be effectively managed with treatment of the etiological factors.
- In uncomplicated, nonsystemic cases, conservative management mainly consists of educating the patient to adopt avoidance behaviors.

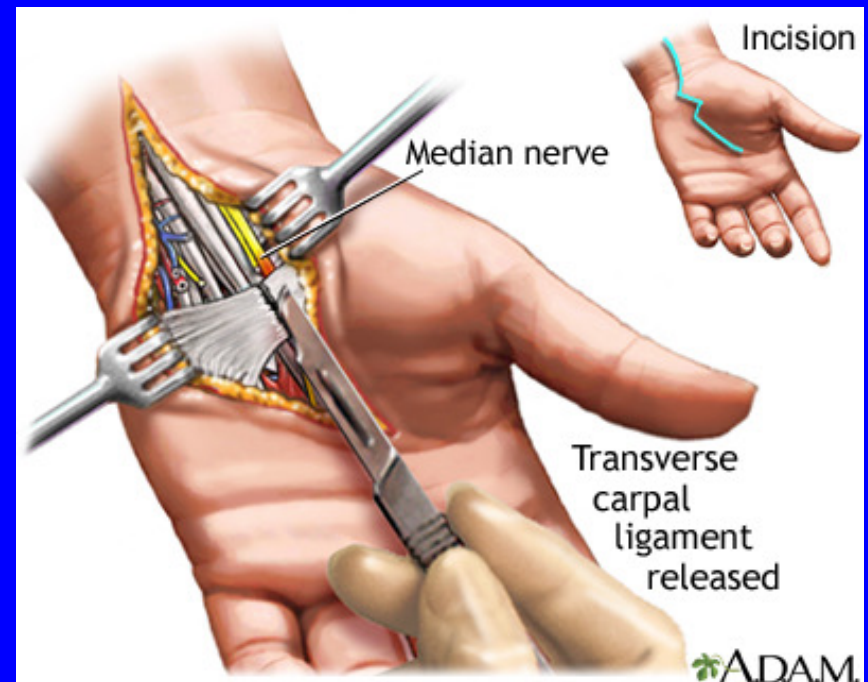
Treatment of entrapment (tunnel) syndromes

- Medical Therapy
- Conditioning exercises and periodically injecting around the nerve with bupivacaine and dexamethasone may accord long-term relief.

Treatment of entrapment (tunnel) syndromes

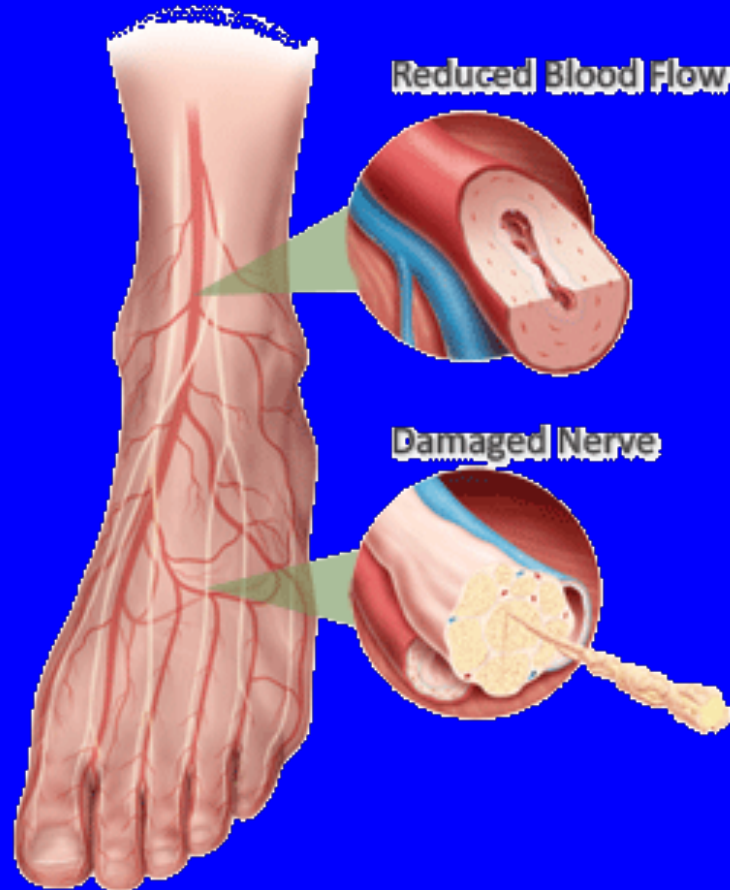
Surgery is recommended for patients with symptoms refractory to nonoperative measures and/or those with severe and long-standing symptoms or weakness.

- In situ decompression
- Medial epicondylectomy
- Subcutaneous transposition
- Etc.



Peripheral Nervous System Diseases

Polyneuropathy



Peripheral Nervous System Diseases

Polyneuropathy

Impairment of Motor Function. Atrophy of affected muscles proceeds slowly over several months, and its degree is proportional to the number of damaged motor nerve fibers.

Tendon Reflexes. The rule is that diminution or loss of tendon reflexes is an invariable sign of peripheral nerve disease.

Fasciculations, Cramps, and Spasms

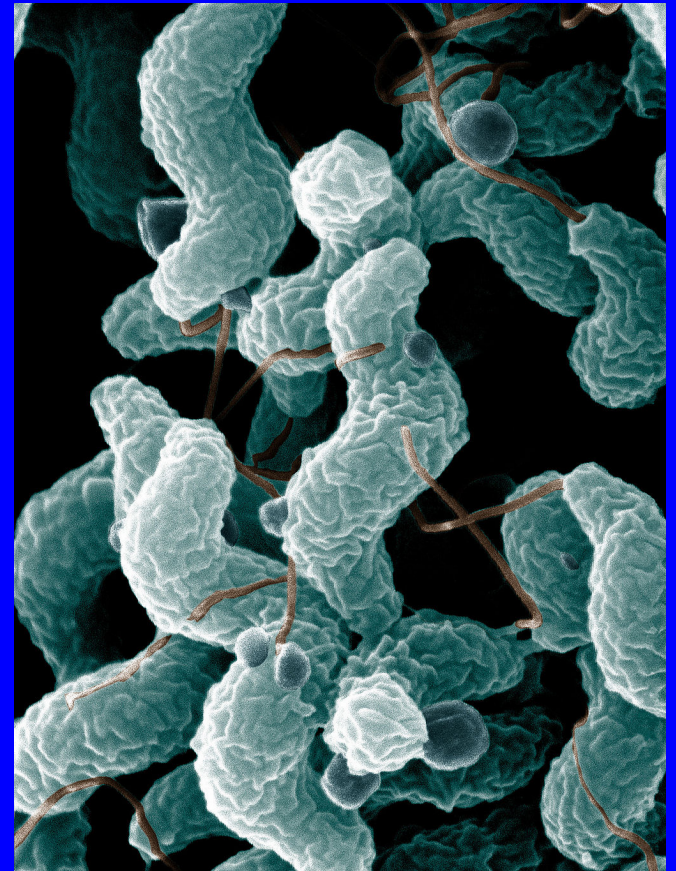
Sensory Loss.

Paresthesias, Pain, and Dysesthesias. They tend to be especially marked in the hands and feet. "Pins and needles," stabbing, tingling, prickling, electric, Novocain-like, and band-like sensations are the adjectives used most frequently to describe these abnormalities.

متلازمة غيلان باريه

Most of the evidence suggests that the clinical manifestations of this disorder are the result of a cell-mediated immunologic reaction directed at peripheral nerve.

2/3 of people with Guillain–Barré syndrome have experienced an infection before the onset of the condition. Most commonly these are episodes of gastroenteritis or a respiratory tract infection. In many cases, the exact nature of the infection can be confirmed. Approximately 30% of cases are provoked by *Campylobacter jejuni* bacteria, which cause diarrhea. A further 10% are attributable to cytomegalovirus (CMV, HHV-5).

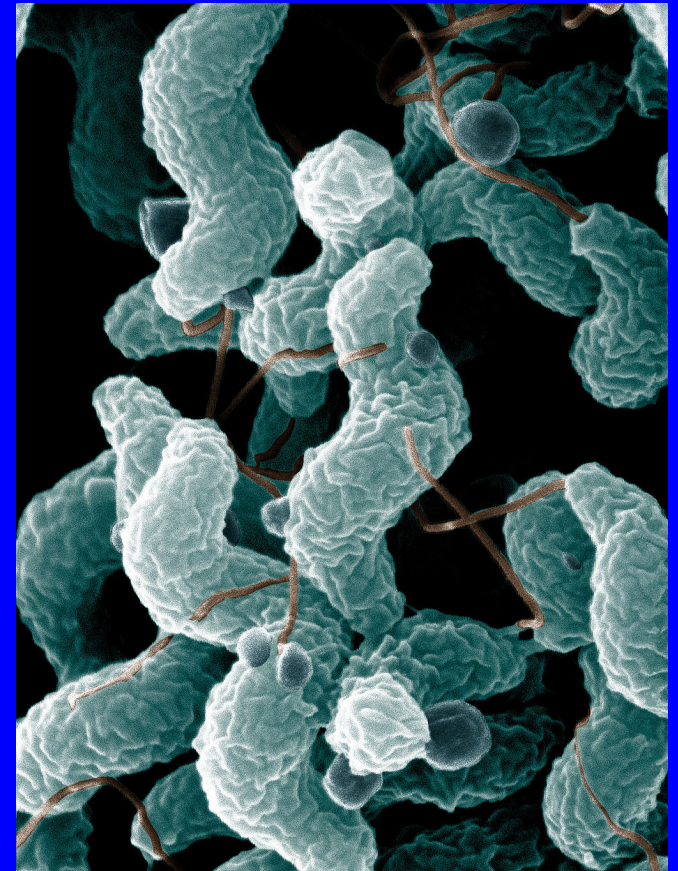


A scanning electron microscope-derived image of *Campylobacter jejuni*

Guillain-Barre Syndrome (Landry-Guillain-Barre-Strohl Syndrome, Acute Inflammatory Polyneuropathy)

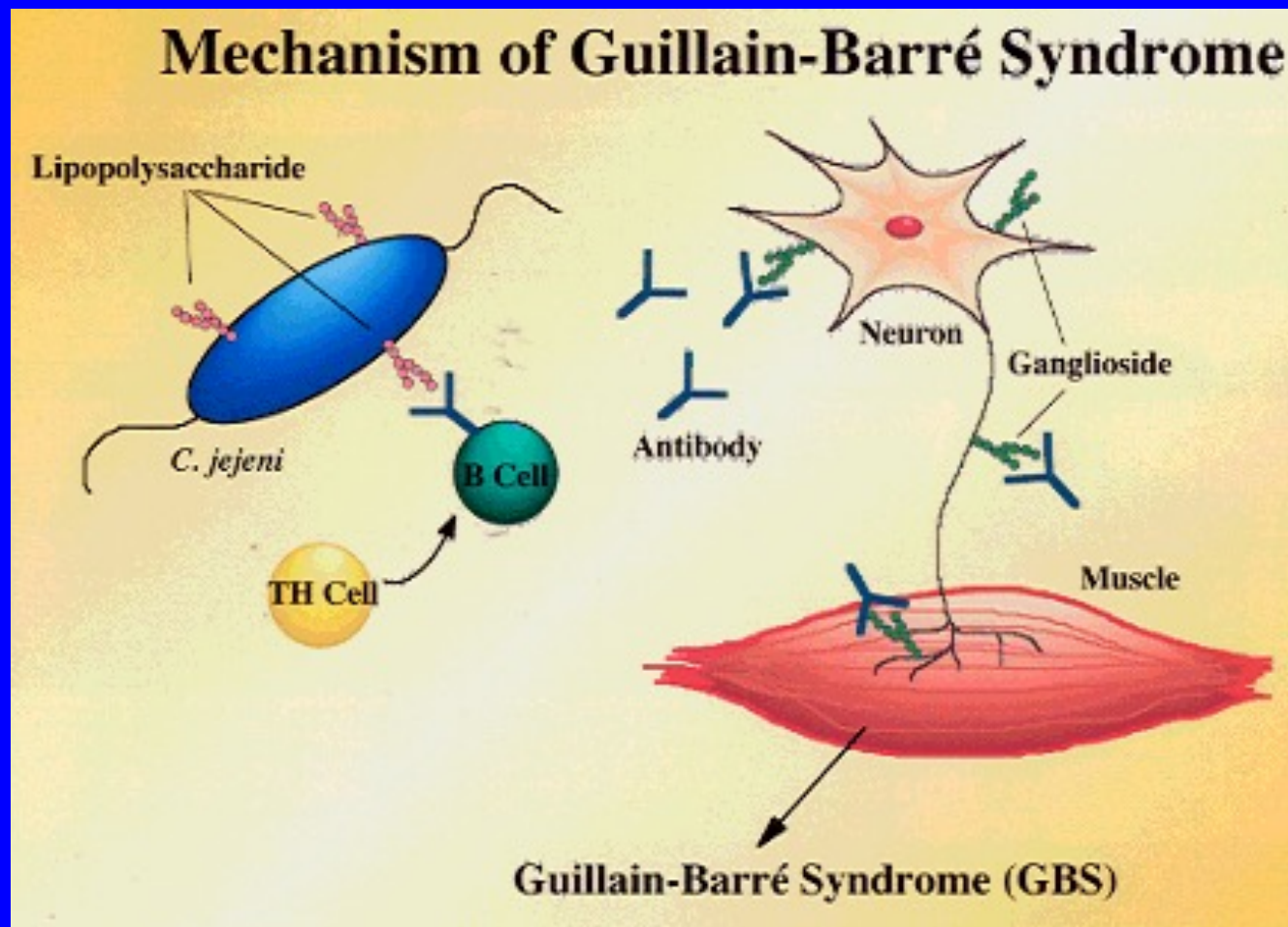
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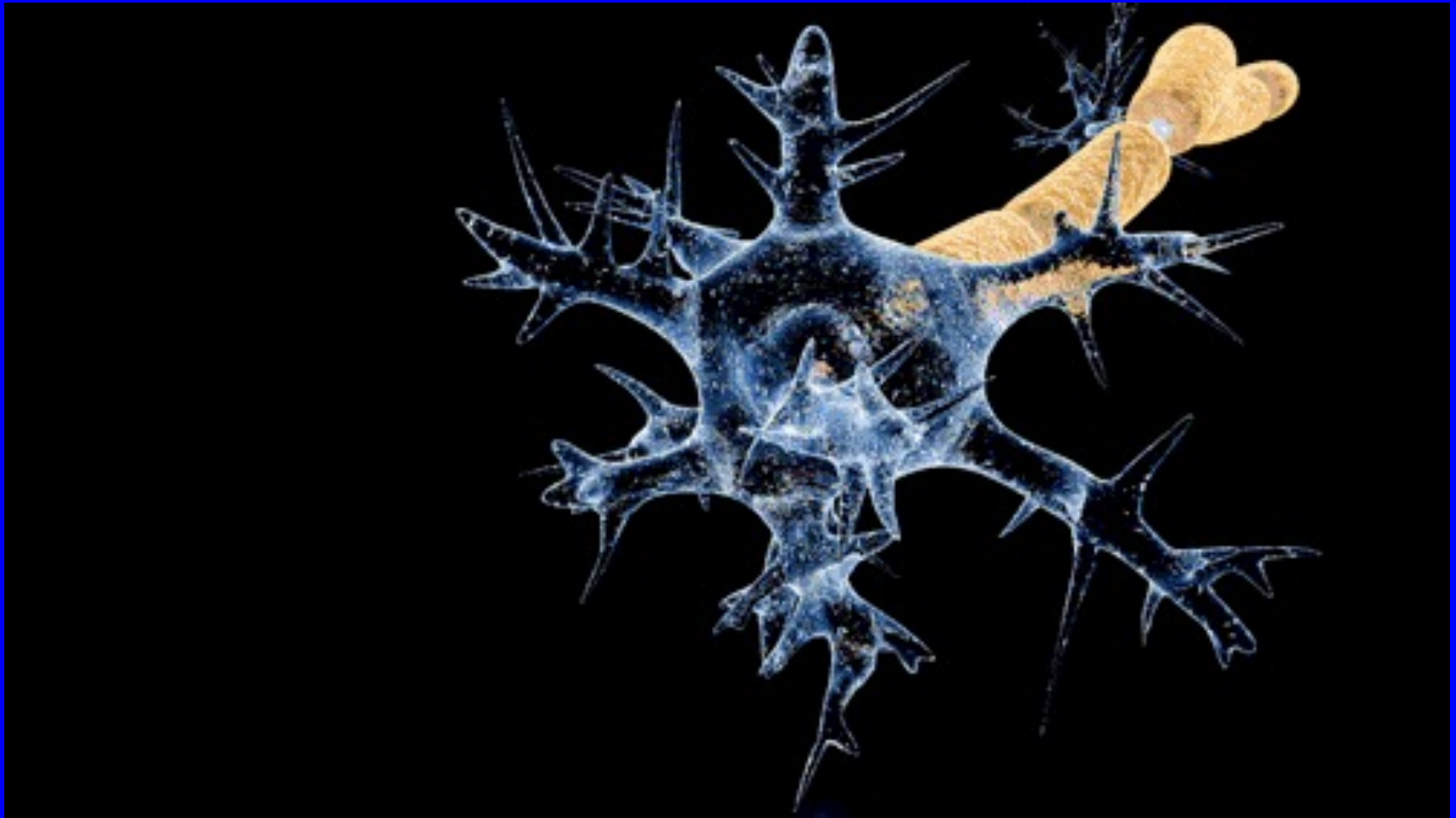


A scanning electron microscope-derived image of *Campylobacter jejuni*

Mechanism of Guillain-Barre Syndrome



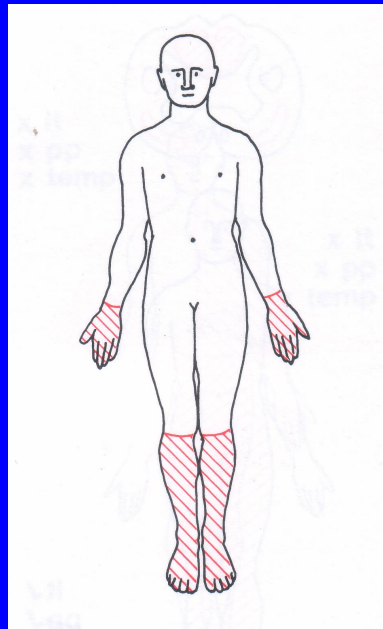
Guillain-Barre Syndrome (Landry-Guillain-Barre-Strohl Syndrome, Acute Inflammatory Polyneuropathy)



Guillain-Barre Syndrome (Landry-Guillain-Barre-Strohl Syndrome, Acute Inflammatory Polyneuropathy)

The first symptoms of Guillain–Barré syndrome are numbness, tingling, and pain, alone or in combination. Objective sensory loss occurs to a variable degree and in a few is barely detectable; when such loss is present, deep sensibility tends to be more affected than superficial.

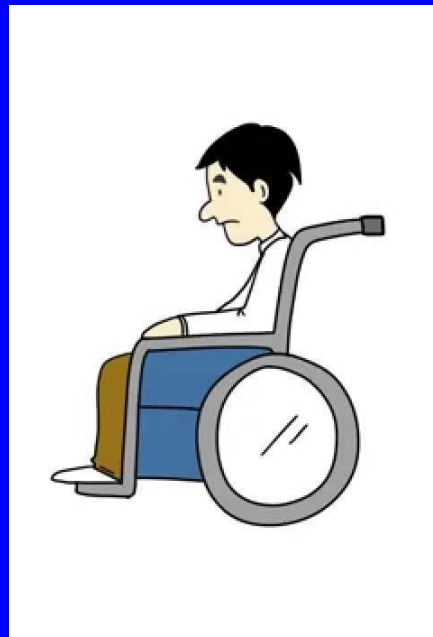
More than half of the patients complain of pain and an aching discomfort in the muscles, mainly those of the hips, thighs, and back.



Guillain-Barre Syndrome (Landry-Guillain-Barre-Strohl Syndrome, Acute Inflammatory Polyneuropathy)

The major clinical manifestation is weakness, which evolves, more or less symmetrically, over a period of several days or a week or two, rarely somewhat longer.

Proximal as well as distal muscles of the limbs are involved, usually the lower extremities before the upper; the trunk, intercostal, neck, and cranial muscles are affected later. The weakness can progress to total motor paralysis with death from respiratory failure within a few days.

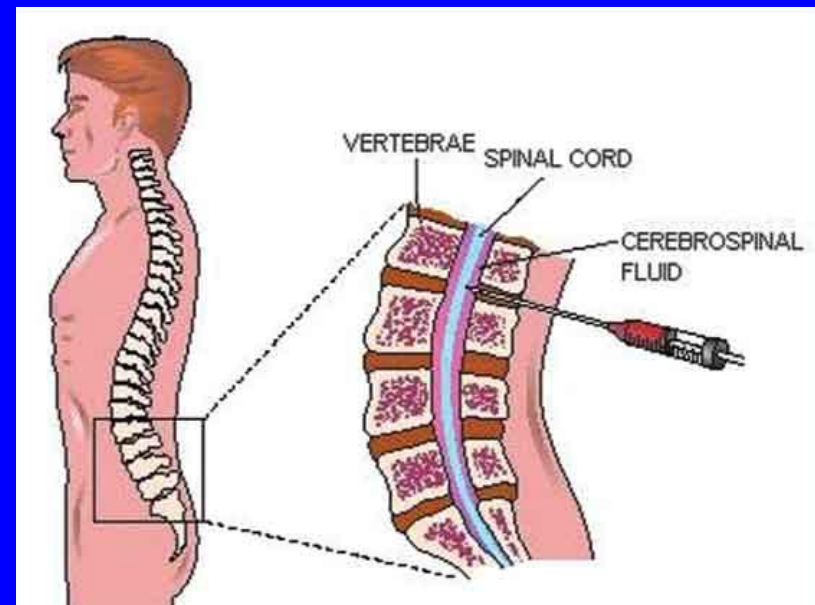
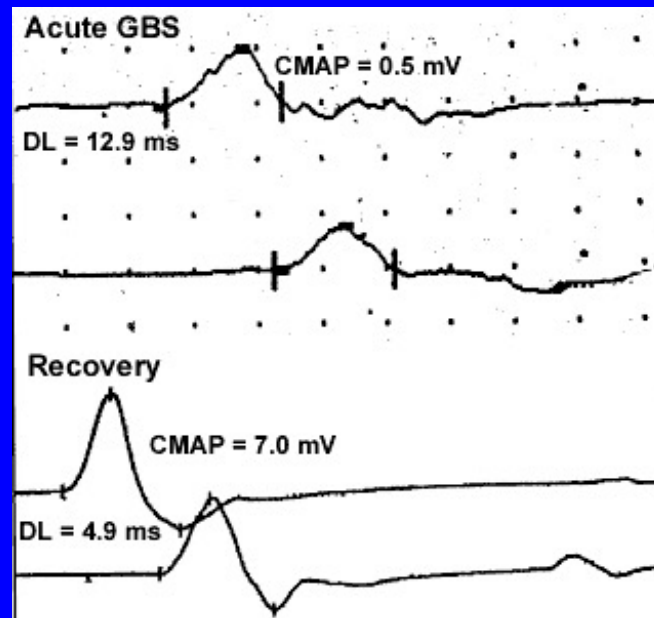


Guillain-Barre Syndrome (Landry-Guillain-Barre-Strohl Syndrome, Acute Inflammatory Polyneuropathy)

DIAGNOSIS

The most important laboratory aids are the electrodiagnostic studies and the CSF examination.

Characteristic findings in Guillain-Barré syndrome are an elevated protein level, usually greater than 0.55 g/L, and fewer than 10 white blood cells per cubic millimeter of fluid ("albuminocytological dissociation").



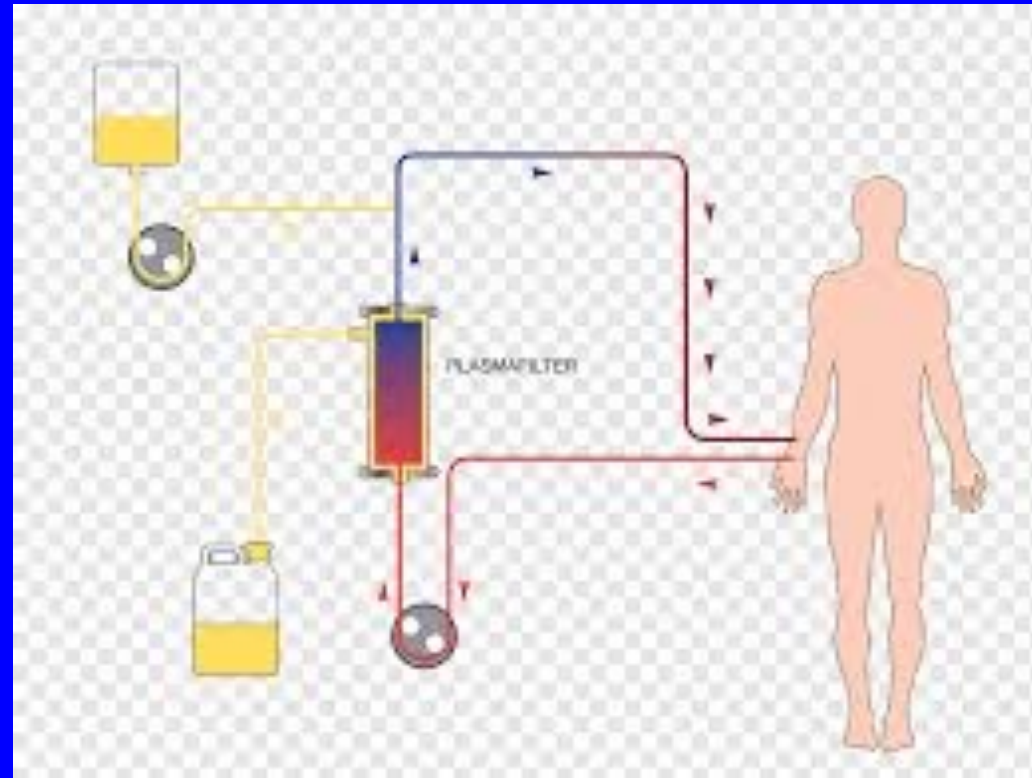
Guillain-Barre Syndrome (Landry-Guillain-Barre-Strohl Syndrome, Acute Inflammatory Polyneuropathy)

TREATMENT

The essential points in the therapy of acute, severe cases are respiratory assistance and careful nursing, since the disease remits naturally and recovery is complete or almost complete in the majority of cases. Support of blood pressure (hypotension from neurovascular dysautonomia occurs in 10 percent of patients) by volume infusion and vasopressor agents and prevention of electrolyte imbalance, gastrointestinal hemorrhage, and particularly pulmonary embolism.



Plasmapheresis and intravenous immunoglobulins (IVIg) are the two main immunotherapy treatments for GBS.



DISEASES OF THE PERIPHERAL NERVOUS SYSTEM

Certain Toxic Polyneuropathies

The peripheral nerves may be affected by a wide variety of toxins, including metals, drugs, and industrial solvents.

Nutritional Deficiency States. In the western world, nutritional polyneuropathy is usually associated with alcoholism.

Arsenical Polyneuropathy. The neuropathic symptoms develop rather slowly, over a period of several weeks or months, and have the same sensory and motor distribution as the nutritional polyneuropathies.

Lead Neuropathy (Plumbism). *Is an uncommon disorder. It occurs following chronic exposure to lead paint or fumes (as occurs in smelting industries or from burning batteries) and ingestion of liquor distilled in lead pipes. Its most characteristic clinical feature is the predominantly motor affection involving mainly the upper extremities.*

Peripheral Nervous System Diseases

Certain Toxic Polyneuropathies

Diabetic Neuropathy. About 15 percent of patients with diabetes mellitus have both symptoms and signs of neuropathy, but nearly 50 percent have either neuropathic symptoms or nerve conduction abnormalities.

Several clinical syndromes have been delineated: (1) diabetic ophthalmoplegia; (2) acute mononeuropathy of limbs or trunk; (3) a rapidly evolving, painful, asymmetrical, predominantly motor multiple neuropathy (a type of *mononeuropathy multiplex*), which usually undergoes remission; (4) a symmetrical, proximal motor weakness and wasting without pain and with variable sensory loss, which pursues a subacute or chronic course; (5) a distal, symmetrical, primarily sensory polyneuropathy affecting feet and legs more than hands in a chronic, slowly progressive manner; (6) an autonomic neuropathy involving bowel, bladder, and circulatory reflexes; and (7) a painful thoracoabdominal radiculopathy. These forms of neuropathy often coexist, particularly the autonomic and distal symmetrical types.

Peripheral Nervous System Diseases

Polyneuropathies

Uremic Polyneuropathy. The neuropathy takes the form of a painless, progressive, symmetrical sensorimotor paralysis of the legs and then of the arms. In some patients, the neuropathy begins with burning dysesthesias of the feet or with sensations of creeping, crawling, and itching of the legs and thighs, which tend to be worse at night and are relieved by movement ("restless legs" syndrome of Ekbom). Renal failure accompanied by diabetes may give rise to a particularly severe neuropathy.

Polyneuropathy with Hypothyroidism. Loss of reflexes, diminution in vibratory, joint-position, and touch-pressure sensations, and weakness in the distal parts of the limbs are the usual findings. The neuropathic manifestations are seldom severe. Nerve conduction velocities are significantly diminished, and the protein content of the CSF is usually increased, to more than 100 mg/dL in some patients.

Peripheral Nervous System Diseases

GENETIC ("LATE") FORMS OF CHRONIC POLYNEUROPATHY

Inherited Polyneuropathies of Predominantly Sensory Type

Dominant Mutilating Sensory Polyneuropathy in Adults

Recessive Mutilating Sensory Polyneuropathy of Childhood

Peroneal Muscular Atrophy [Charcot-Marie-Tooth Disease, or CMT Types 1 and 2; Hereditary Motor-Sensory Neuropathy, or HMSN Types I and II (Dyck)]

Hypertrophic Neuropathy of Infancy (Dejerine-Sottas Disease or HMSN III)

Hereditary Areflexic Dystasia (Roussy-Levy Syndrome)

Chronic Polyneuropathy with Hereditary Spastic Paraplegia

Peripheral Nervous System Diseases

Inherited Polyneuropathies with a Recognized Metabolic Disorder

**Refsum Disease (Heredopathia Atactica
Polyneuritiformis; HMSN IV of Dyck)**

**Abetalipoproteinemia (Bassen-Kornzweig
Syndrome, Acanthocytosis)**

Tangier Disease

Metachromatic Leukodystrophy

Familial Dysautonomia (Riley-Day Disease)

Amyloid Neuropathies

Muscular Dystrophies and Other

Myopathies with Neuropathy

ELECTRONEUROGRAPHY

- Electroneurography, or nerve conduction study (NCS) is a measurement of the speed of conduction of an electrical impulse through a nerve. NCS can determine nerve damage and destruction.

ELECTRONEUROGRAPHY



Electroneurography can detect pathological changes in the form of myelinopathy and/or axonopathy

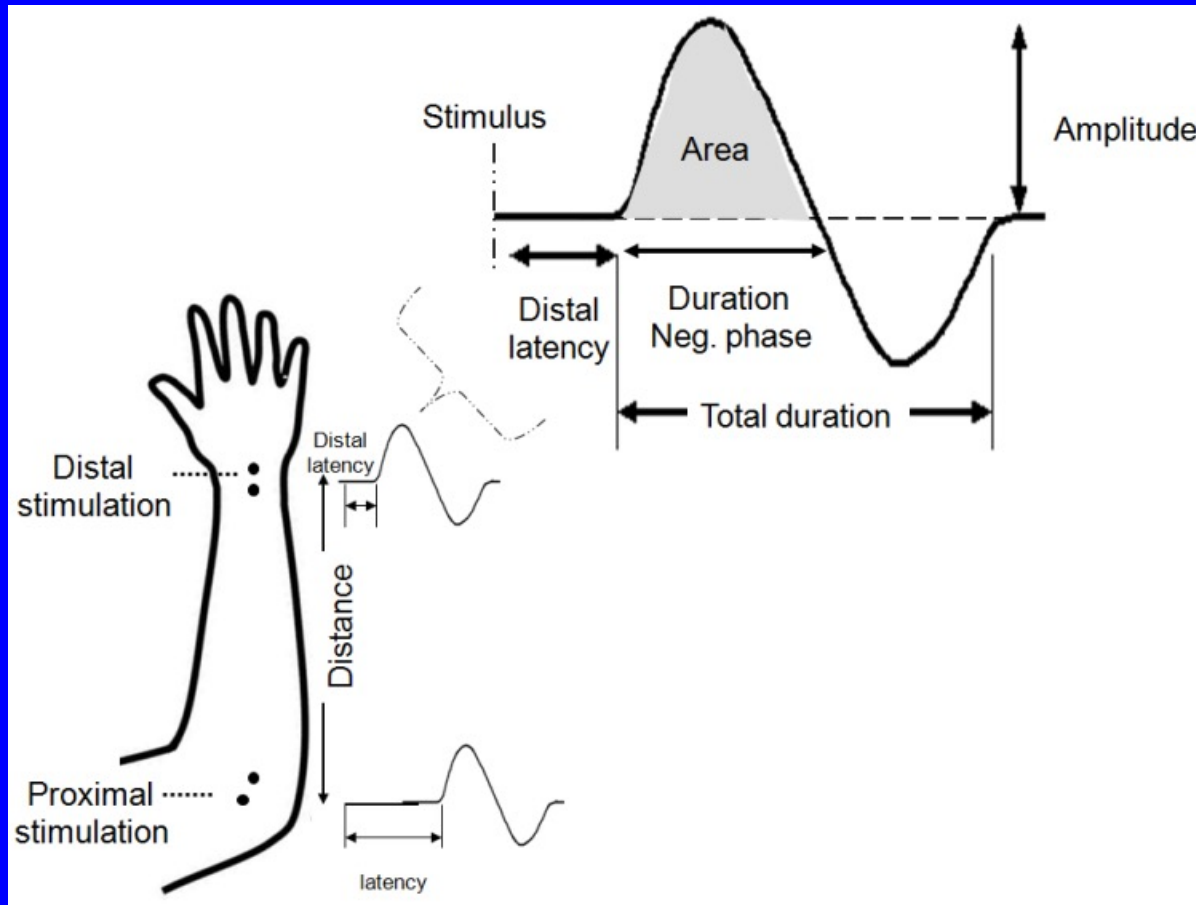
ELECTRONEUROGRAPHY

- The responses are recorded using electrodes applied over the muscle innervated by the nerve (motor nerve conduction) or from the skin (sensory nerve conduction).

ELECTRONEUROGRAPHY

- Motor NCS
- The time the impulse takes to travel from the stimulation to the muscle is called distal motor latency and is measured in milliseconds.

Motor NCS



The nerve conduction velocity (speed) is calculated by measuring the distance between electrodes and the time it takes for electrical impulses to travel between electrodes.

ELECTRONEUROGRAPHY

- Sensory NCS

Sensory NCS are performed by electrical stimulation of a peripheral nerve while recording the transmitted potential at a different site along the same nerve.

Train your Brain with NEUROLOGY!



Thank you!