Diseases of peripheral nerves

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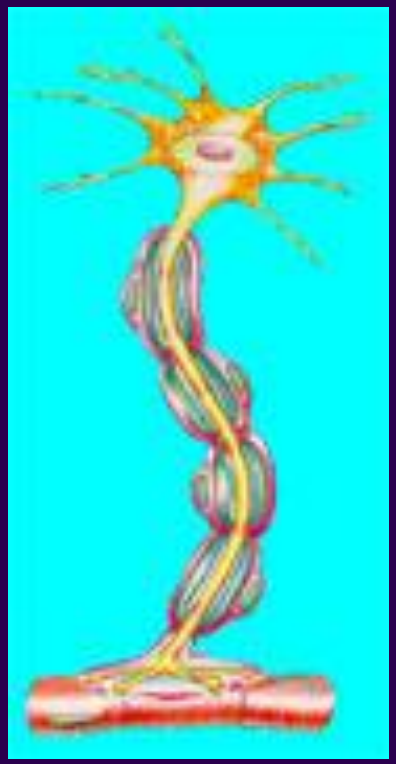
2018

Mononeuropathies

Classification of lesions of peripheral nerves



Normal

Neurotmesis

Axonotmesis

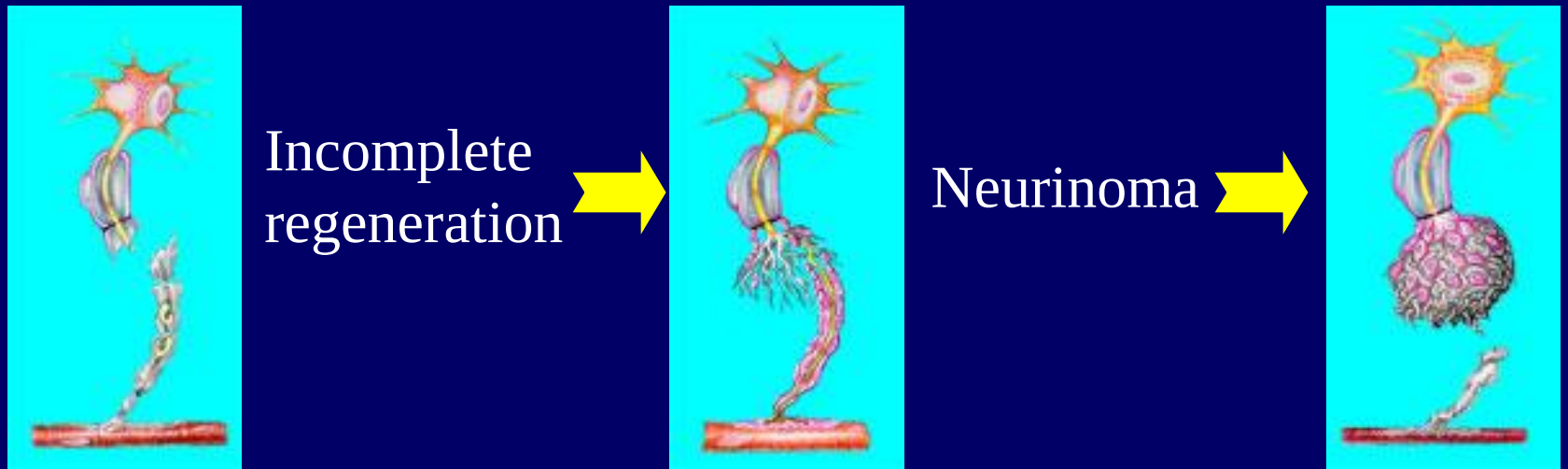
Neurapraxia

Neurotmesis

Interruption of the entire nerve, including the supporting connective tissues (both axons and nerve sheaths are involved).

Clinical features:

- **Motor signs** - **peripheral type of paresis**
- **Sensory signs** - **sensation is affected on the region supplied by the injured nerve.**
- **Autonomic signs** - **vasomotor, sudomotor, trophic changes**



Axonotmesis

The axons lose their continuity but the connective tissue remain more or less intact and the Schwann cell basement membrane survives.

The Wallerian degeneration of the distal part of the nerve is complete, but regeneration is always present and runs its normal course.

Clinical features:

same like in the neurotmesis

Neurapraxia

Transient loss of conduction without structural changes, without interruption of the continuity of any of the nerve components.

Recovery: takes place within days or weeks and is complete in 6-8 weeks after removal of the cause.

Clinical features:

- **Motor signs: mainly paresis, no muscular atrophy**
- **Sensory signs: mostly subjective (numbness, tingling, burning), the loss of sensation is rare, the deep sensory qualities may be affected.**

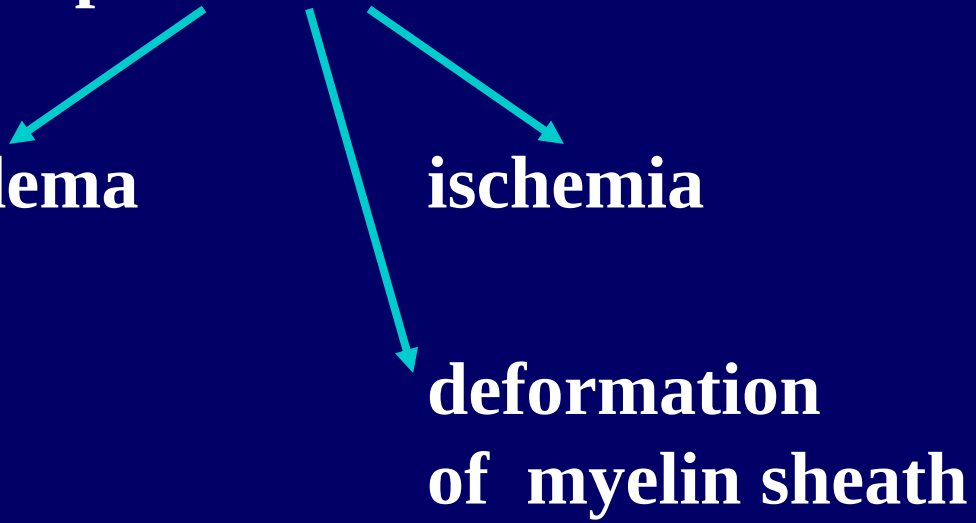
The most frequent causes of the injuries of the nerves

1. Trauma
2. Ischemia

   occlusion

   compression of arteries
3. Pressure

   nerve compression



Diagnosis of nerve lesions

1. Anamnesis
2. Physical examination

2. Special diagnostic methods

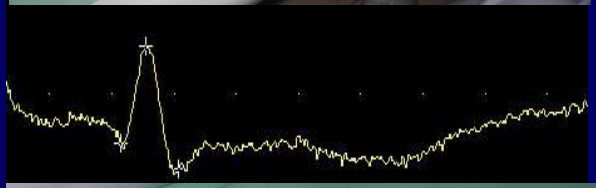
- Sweet test (Minor test, Ninhydrin test)
- Electrophysiology

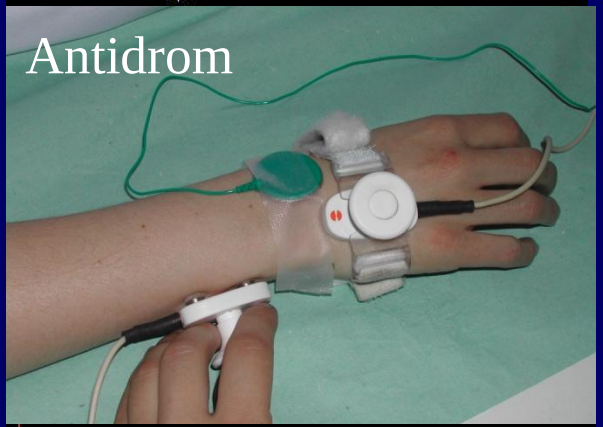
ENG: Motor and sensory nerve conduction studies are important to ascertain the site and nature of the injury.

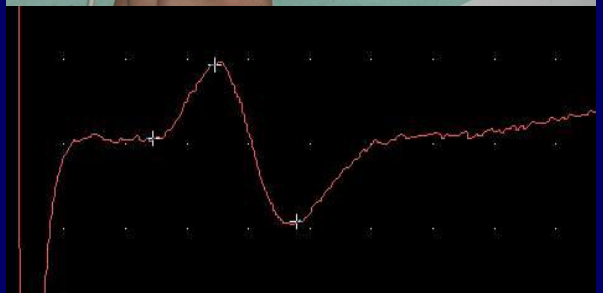
EMG: localization, severity of the lesion, signs of denervation and regeneration (time course), differentiation of nerve-plexus-root injuries


ENG

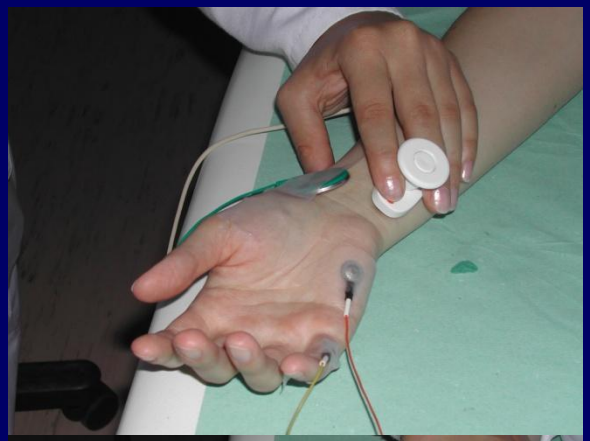
SENSORY

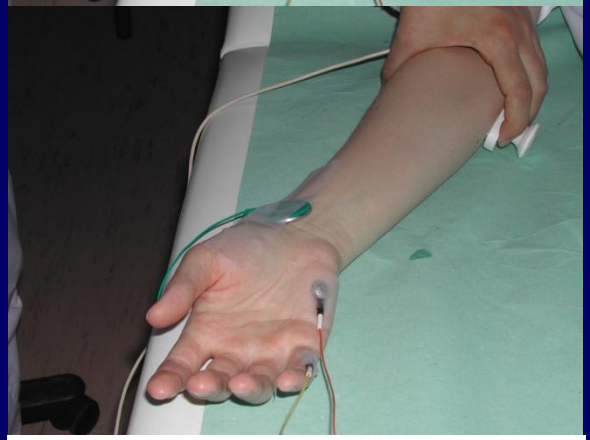


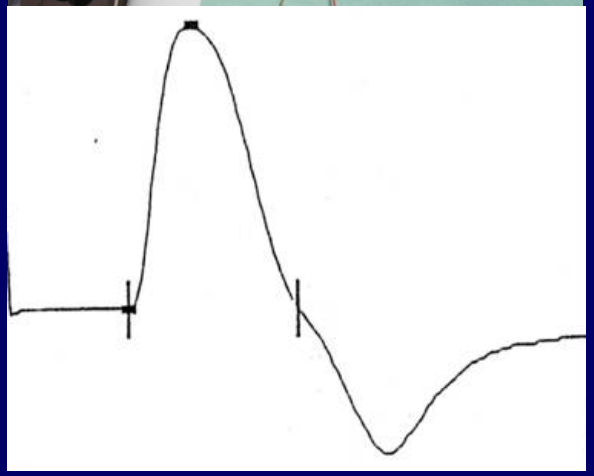




MOTOR



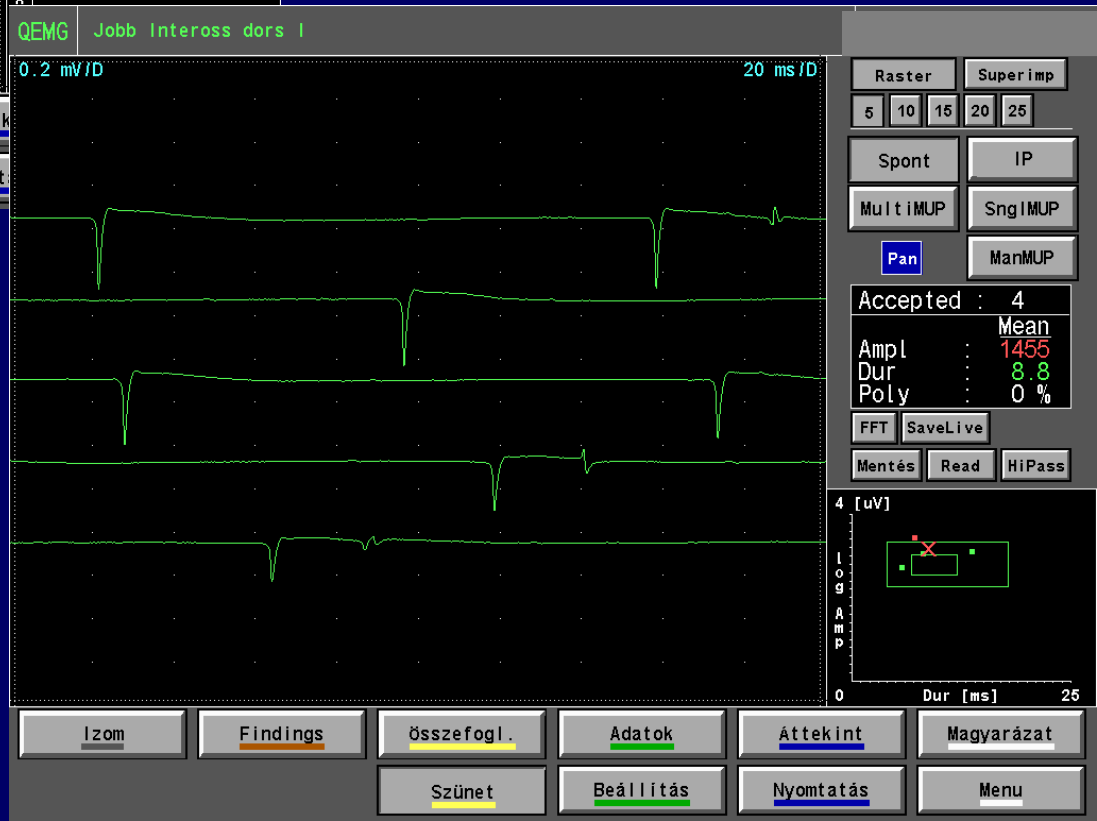


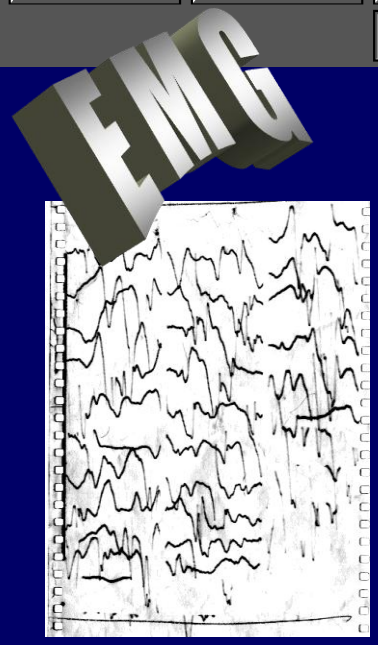


Signs of denervations

Fibrillation potentials

Positive sharp waves





Treatment

1. **Conservative therapies**

Purpose to preserve the best possible condition

to prevent the swelling of tissues

atrophy of muscles

contractures

Passive movements, re-educative exercises

Electrical stimulation

2. **Surgical treatments**

ends of transsected nerve should be sutured

Urgent? Postponed (in 2-3 months) operations?

Infected wounds	**postponed operation**
Prevention of scar formation	**atraumatic surg.techniques**
Long gap	**auto-, allograft**
Entrapment syndromes	**decompression**

Regeneration

- **Sprouting of the proximal stump**
- **The scars may impede the successful regeneration**
- **The time of complete regeneration is determined**

  gap between nerve stumps,

  integrity of the Schwann cell bundle,

  age.
- **Speed of regeneration**

  1 - 1.5 mm/day (motor fibers)

Brachial plexus

Upper brachial plexus lesion (Erb-Duchenne)

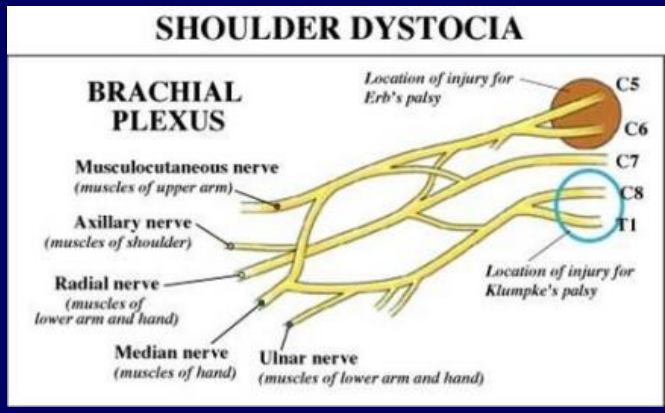
Cause
- traction on the arm at birth
- falling on the shoulder
- luxation/ cruel reposition of the shoulder joint

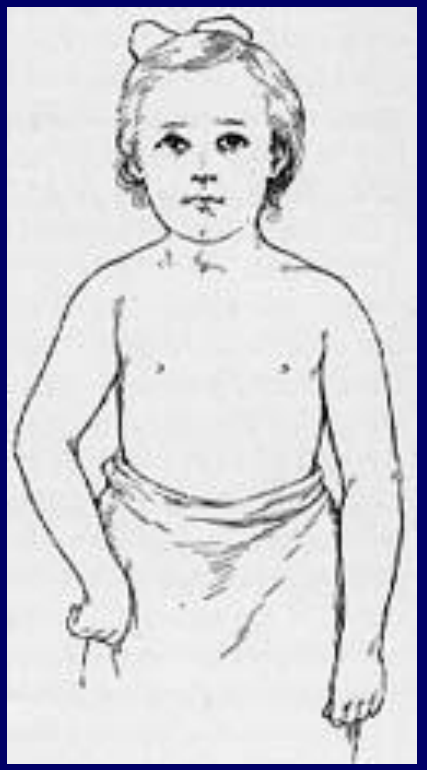
Position of arm
- internal rotation
- elbow is extended
- hand pronated

Paresis
- abduction, external rotation of arm
- flexion of the elbow

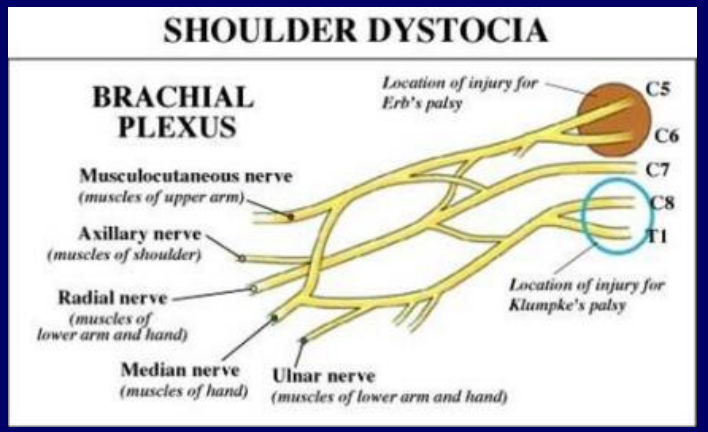
Hypaesthesia
- incomplete,
  on the outer surface of the arm

Reflexes
- biceps is absent





Lower brachial plexus lesion (Dejerine-Klumpke)



Cause

- birth injuries
- trauma
- tumor

Motor signs

- paralysis and atrophy of intrinsic hand muscles
- claw position

Sensory disturbances (hypesthesia)

- inner side of the arm/forearm
- ulnar side of the hand

Sympathetic lesion
(branch inf. cervical ganglion)

- Horner syndrome

Neuralgic amyotrophy (brachial plexus neuritis)

Unilateral or bilateral disorder of the brachial plexus

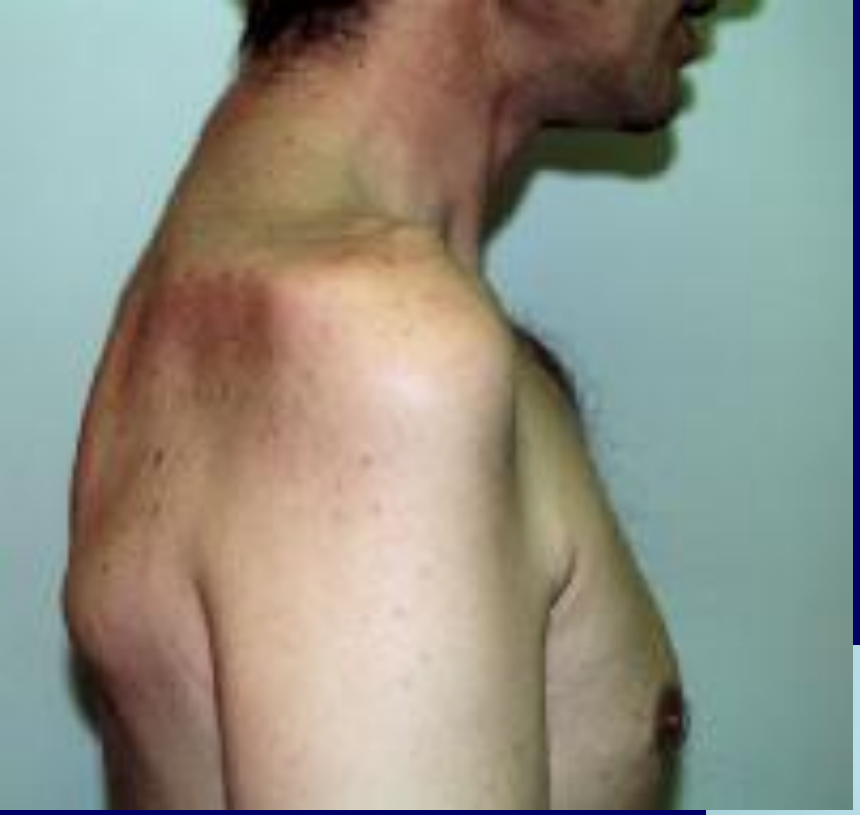
Onset: **acute severe shoulder pain,**
it follows infections,
injection of serum vaccine,
strenuous exercise, trauma, pregnancy

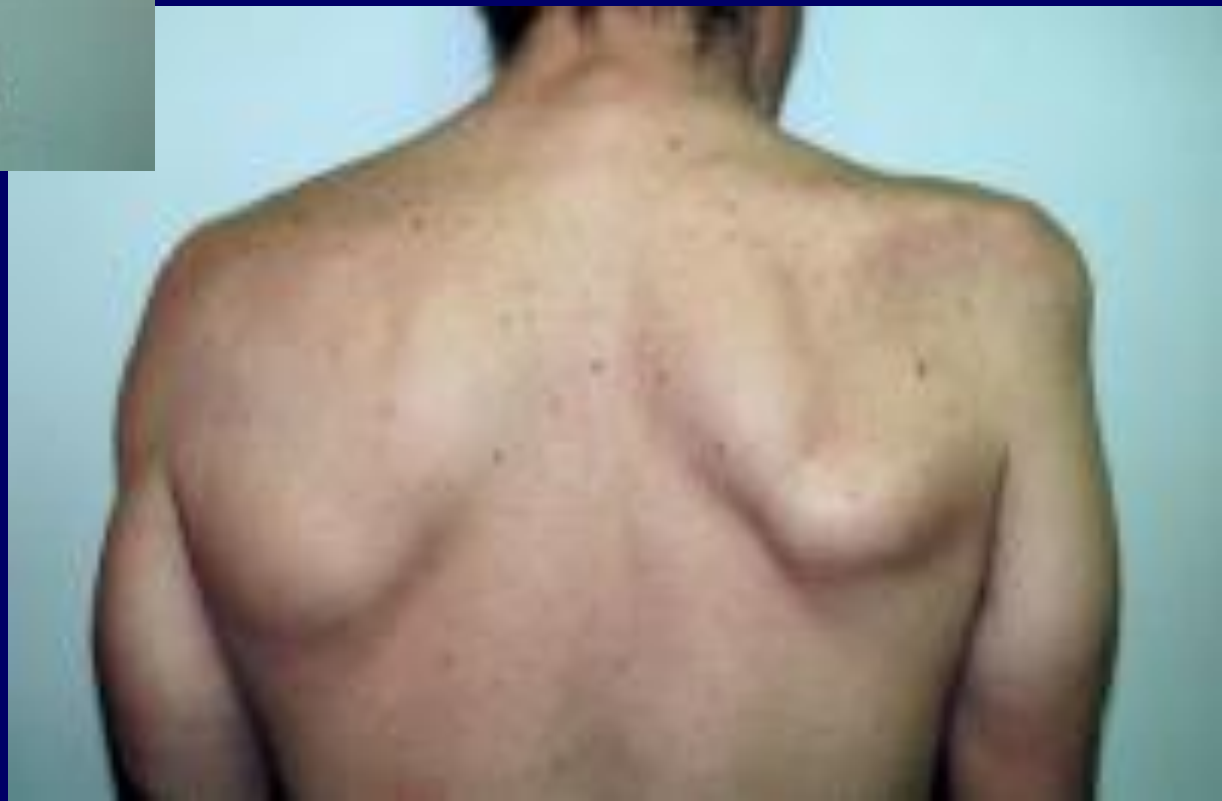
Cause: **unknown**
autoimmun neuropathy is suggested

Clinical characteristics:
rapidly developing proximal weakness, atrophy,
sensory deficit on the region of axillary nerve,
prognosis is usually good.

Electrophysiology: **signs of lesions of brachial plexus.**

Treatment
symptomatic - painkiller,
intensive physiotherapy,
anti-inflammatory preparations (corticosteroids)





Nerves

Long thoracic nerve

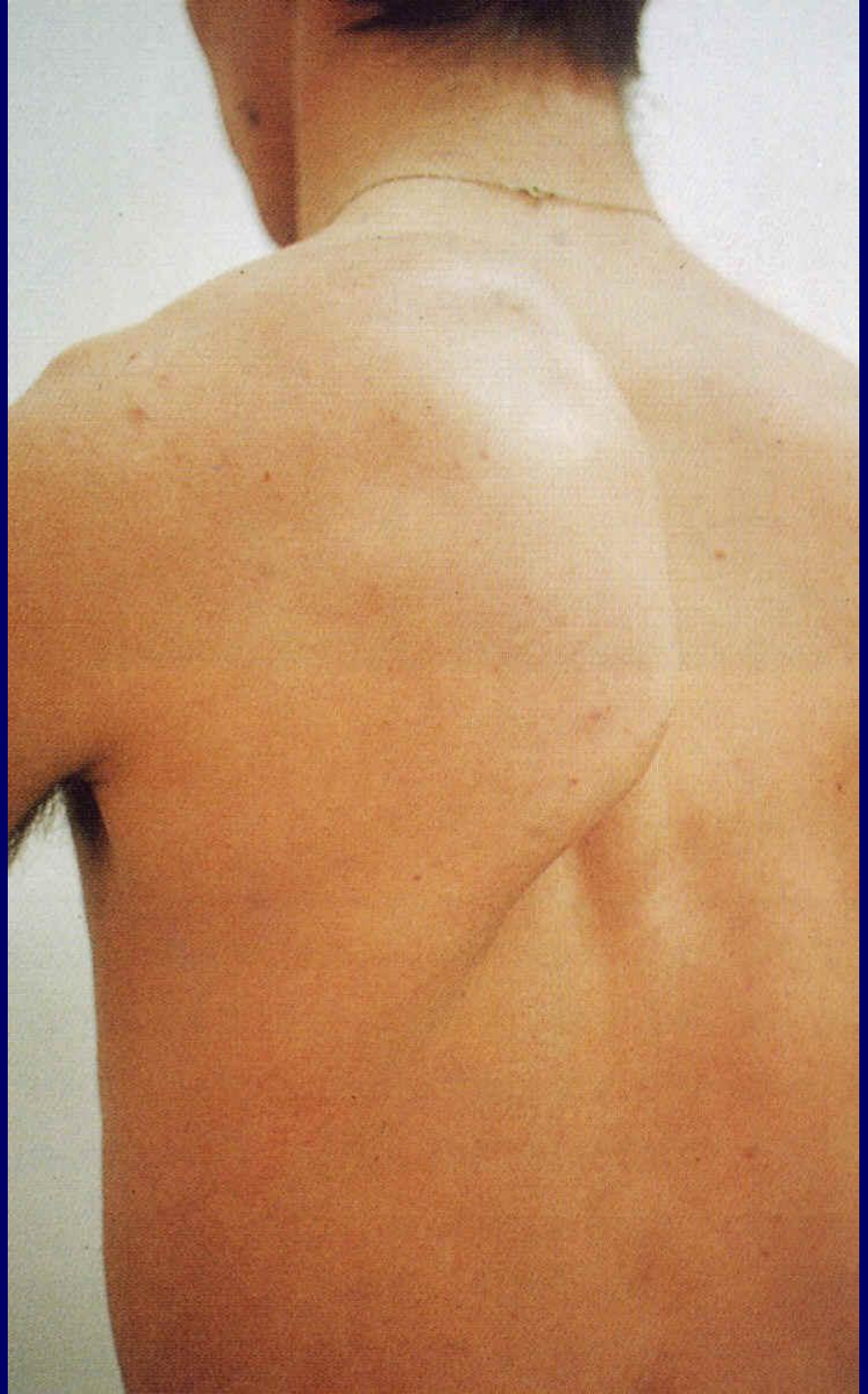
In men doing heavy physical work

- **Clinical features**

weakness:

– elevation of arm above horizontal plane

– winging of the scapula



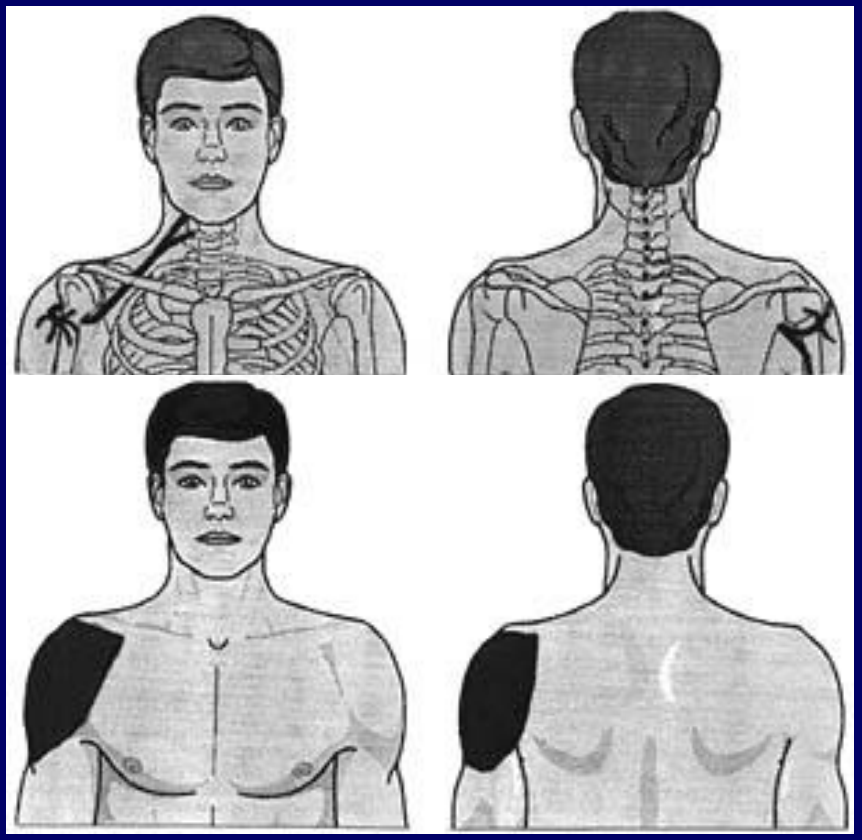
Axillary nerve

Motor innervations:

- teres minor,
- deltoid

Sensory innervations:

- above deltoid muscle

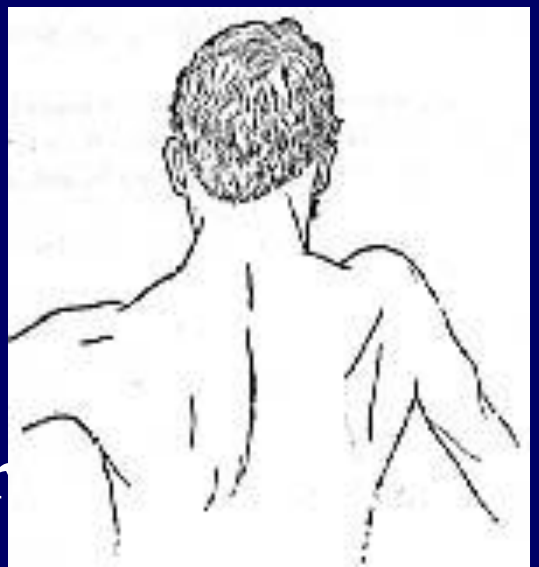


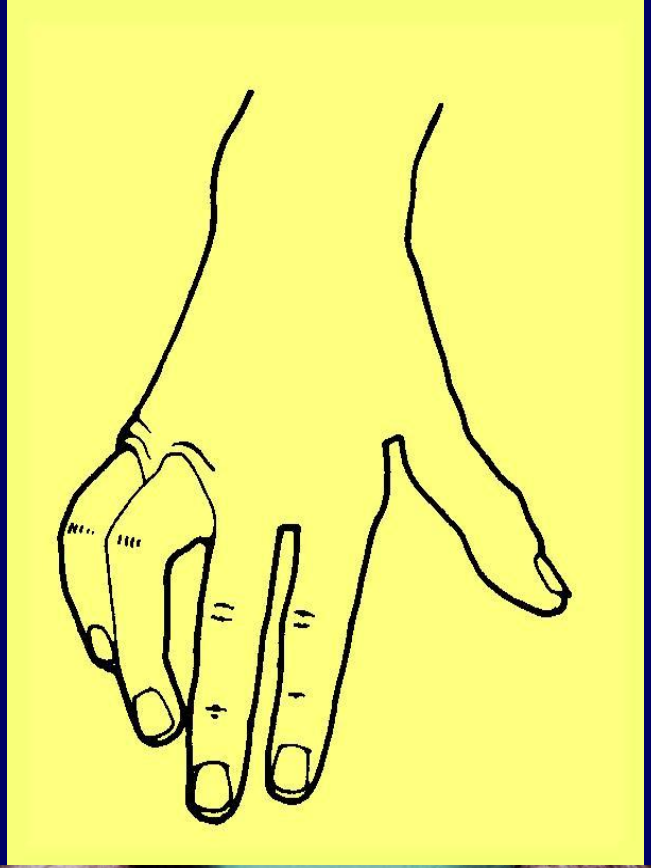
Cause of the lesion

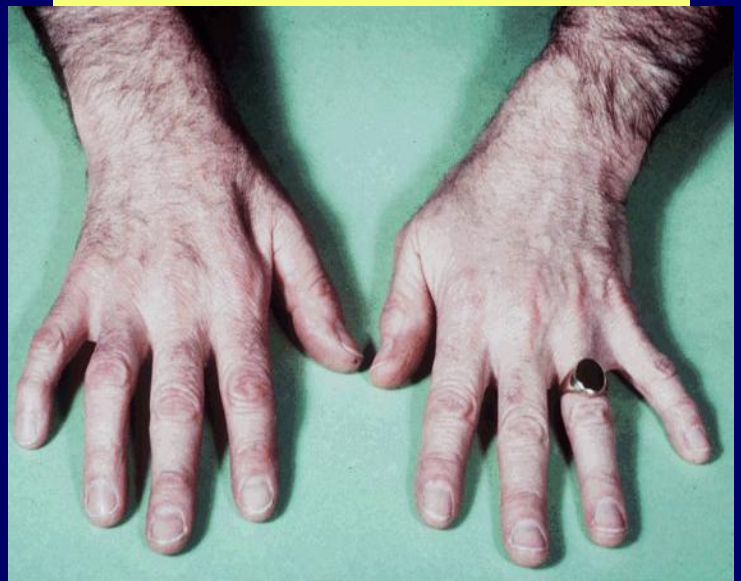
- trauma of the shoulder
  (contusion, traction)

Clinical features

- weakness: abduction of the arm
- hypoesthesia: lateral surface of shoulder







Ulnar nerve

Clinical features

weakness

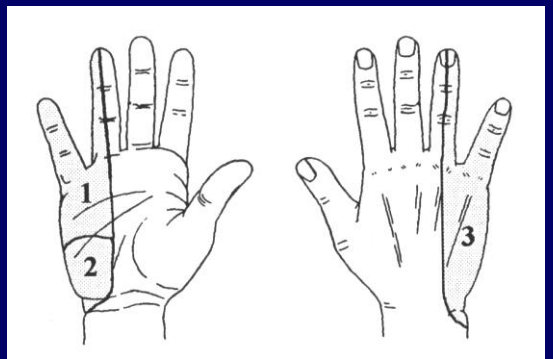
- flexion, adduction of wrist
- flexion of ring, little fingers
- abduction of little finger
- adduction of thumb

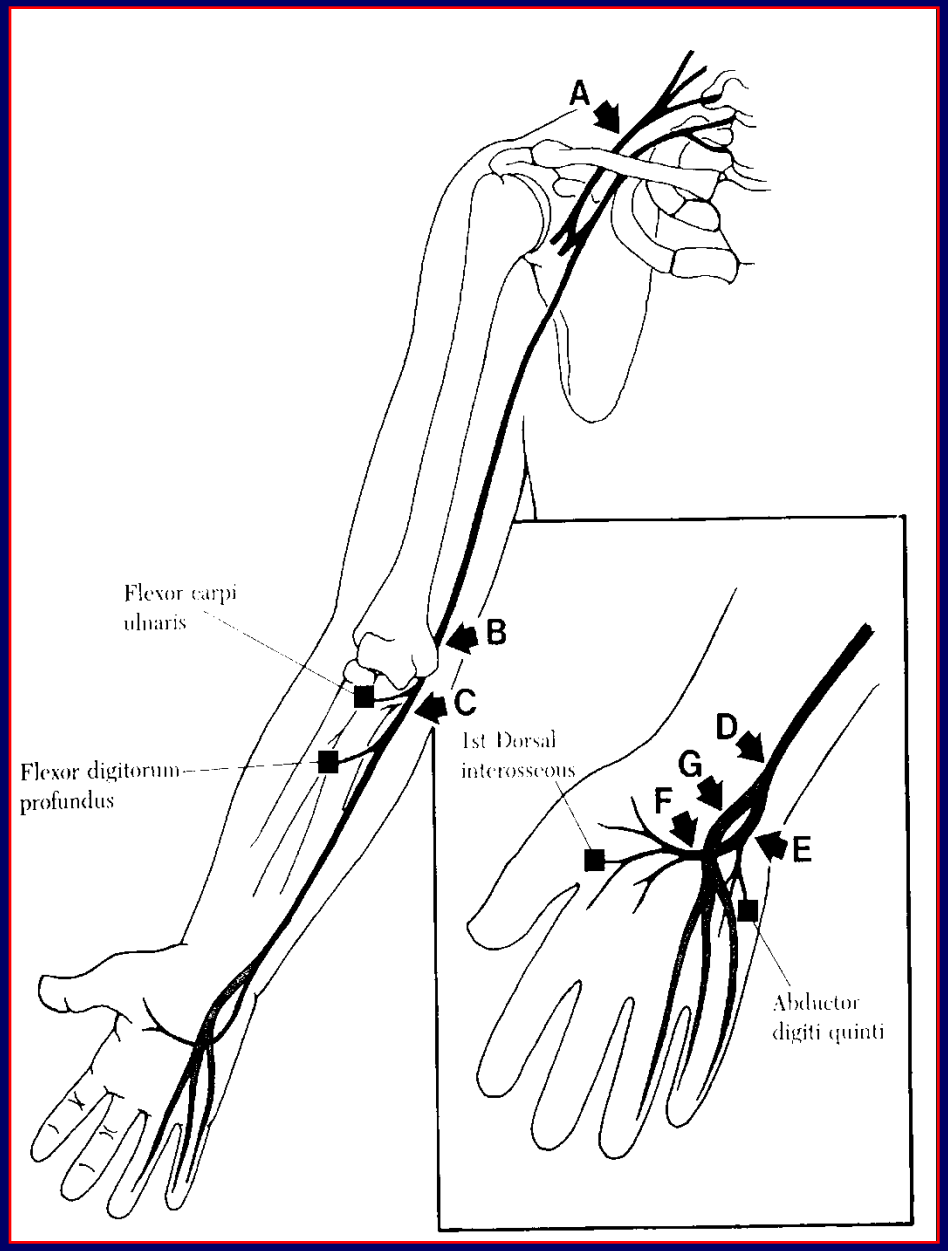
atrophy

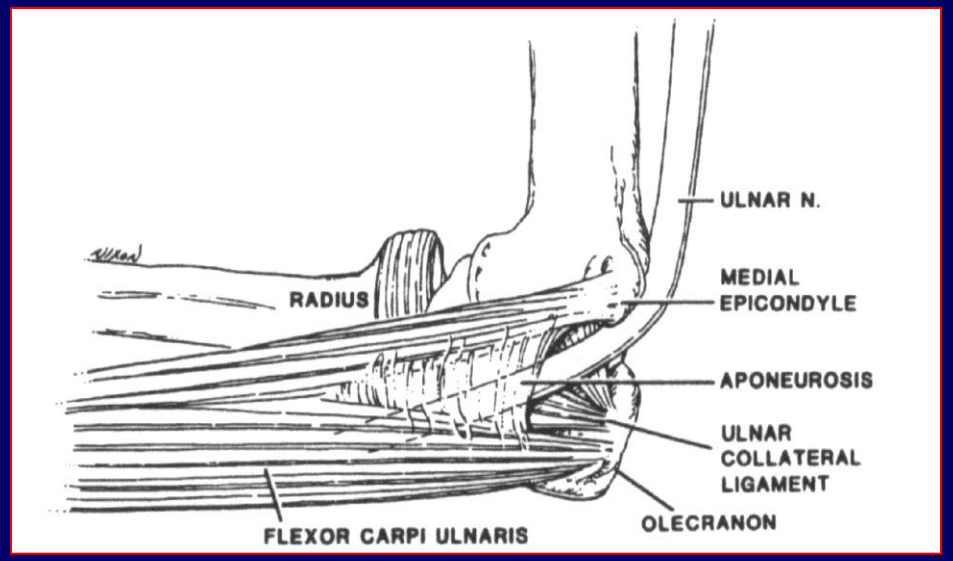
- hypothenar and interossei

clawing of the hand

sensory loss

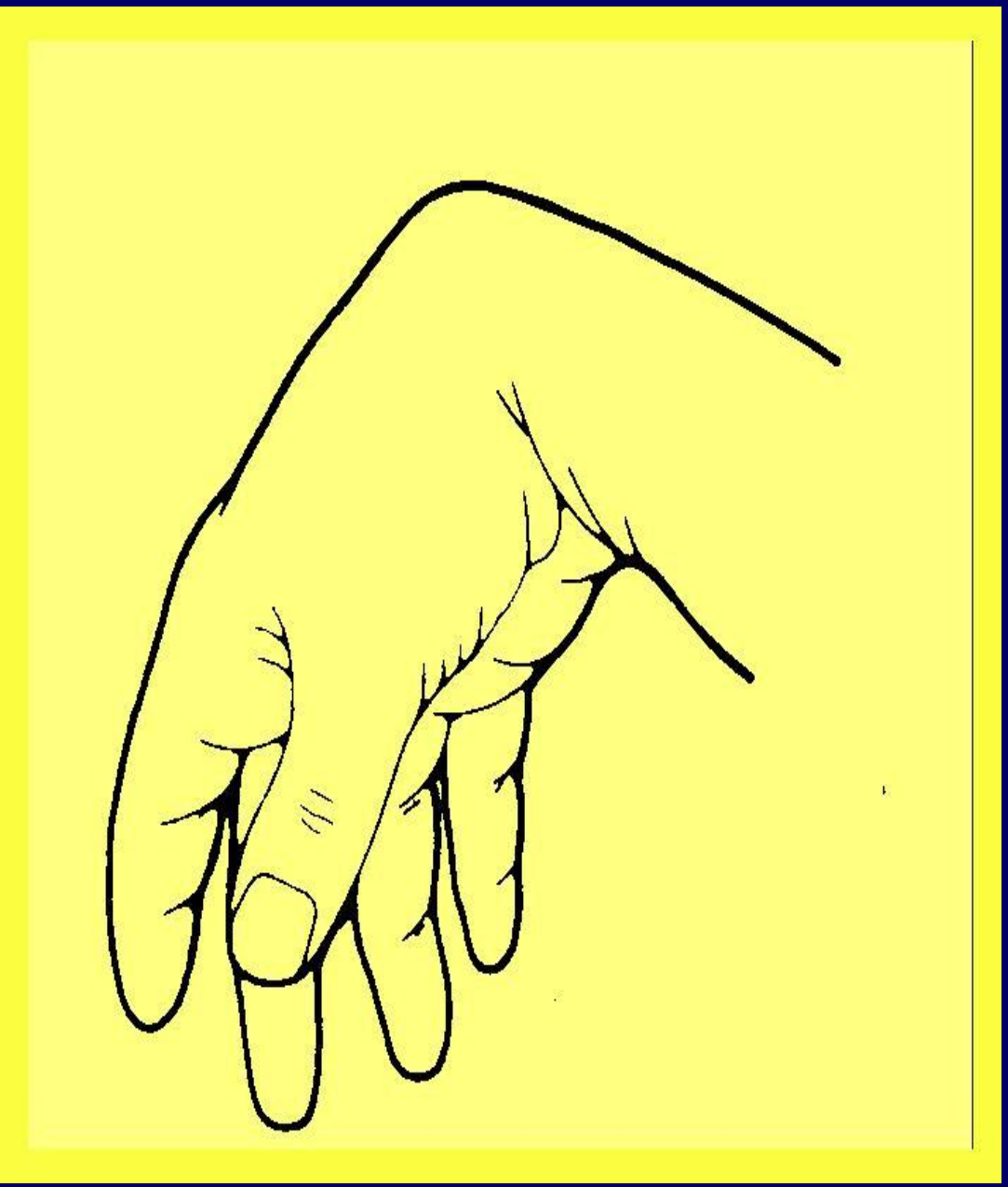






Places of compression of ulnar nerve

Radial nerve



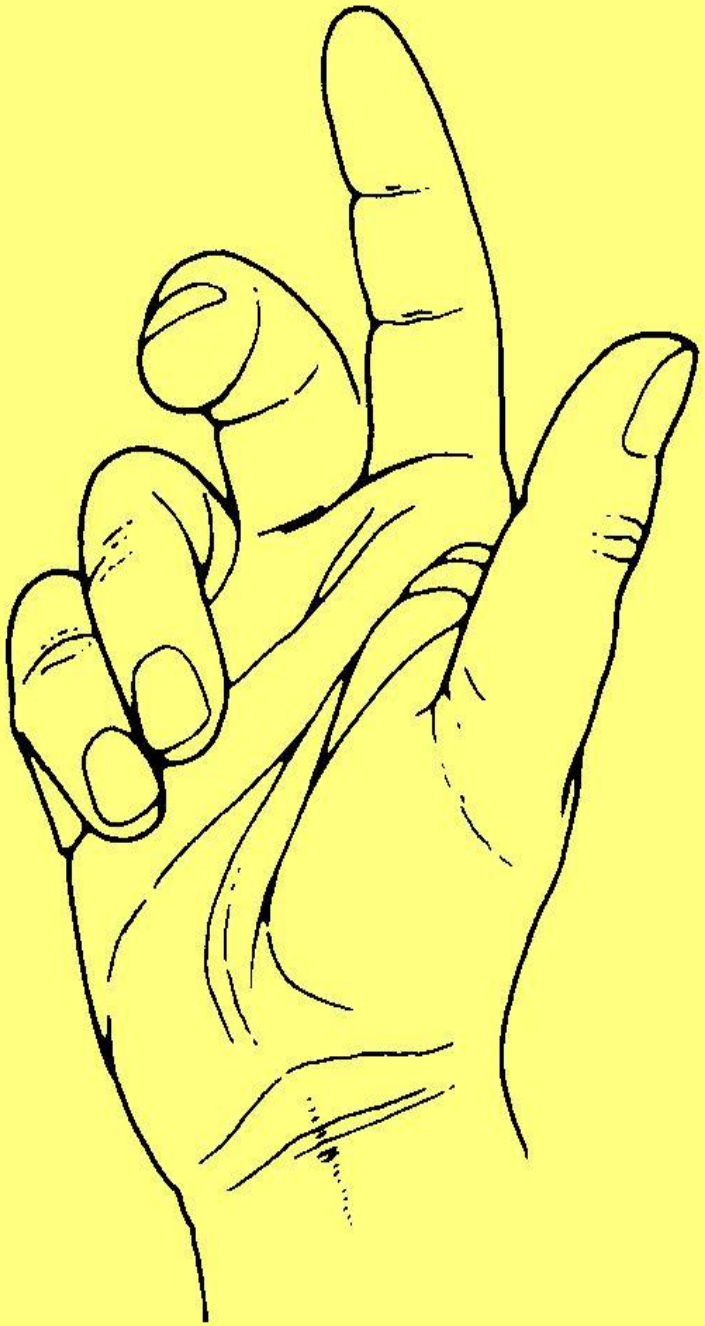
- **Weekness**

extension ('wrist drop'):

wrist, fingers

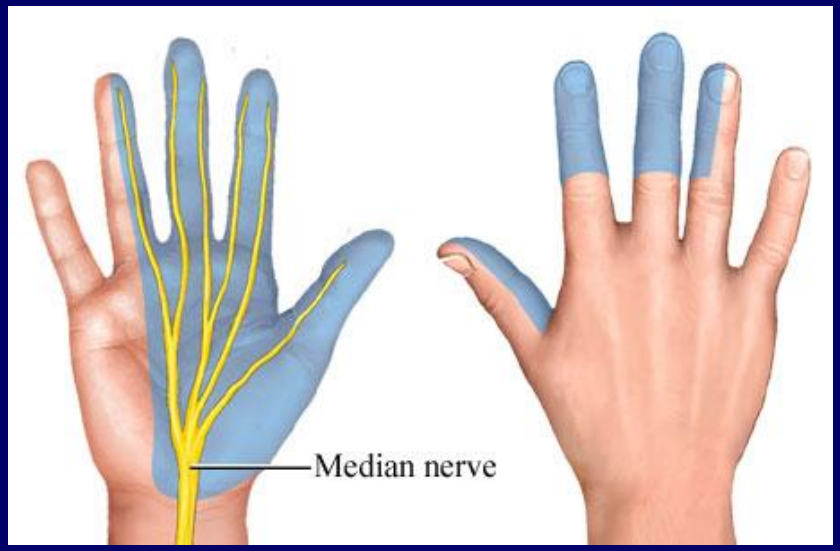
"park bench paralysis”,

"Saturday night palsy"



Median nerve

"preacher's hand"



Carpal tunnel syndrome

Localisation

compression of median nerve by transverse carpal ligament at wrist

Predisposing factors

constitutional features, fractures, arthritis, pregnancy, diabetes mellitus, hypothyreosis, sudden increase in weight, gout, strenuous exercise

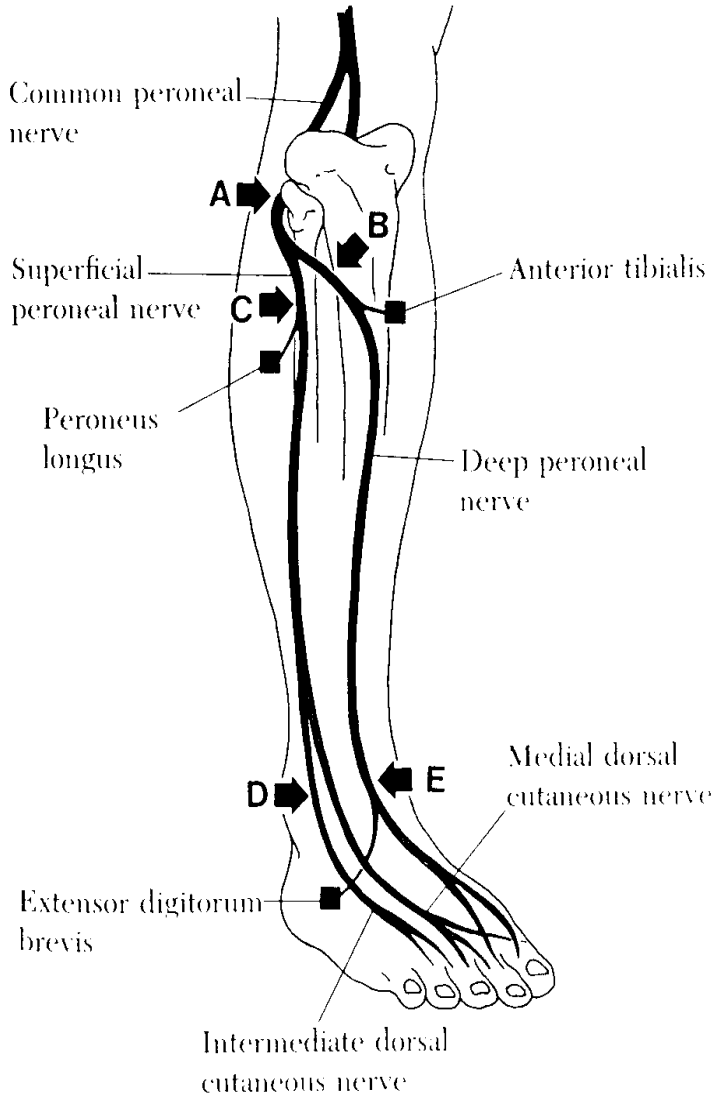
Clinical features

nocturnal brachialgia paresthetica, pain irradiating into 1-3 fingers, pain upon pressure on the median nerve, typical sensory loss, hand is swollen, joints are rigid, atrophy and weakness of the thenar muscles

Treatment

inmobiliztion of wrist, local infiltration with cortisol, decompression

Common peroneal nerve



Most frequent localization

Capitulum fibulae

Causes

Fracture of fibula

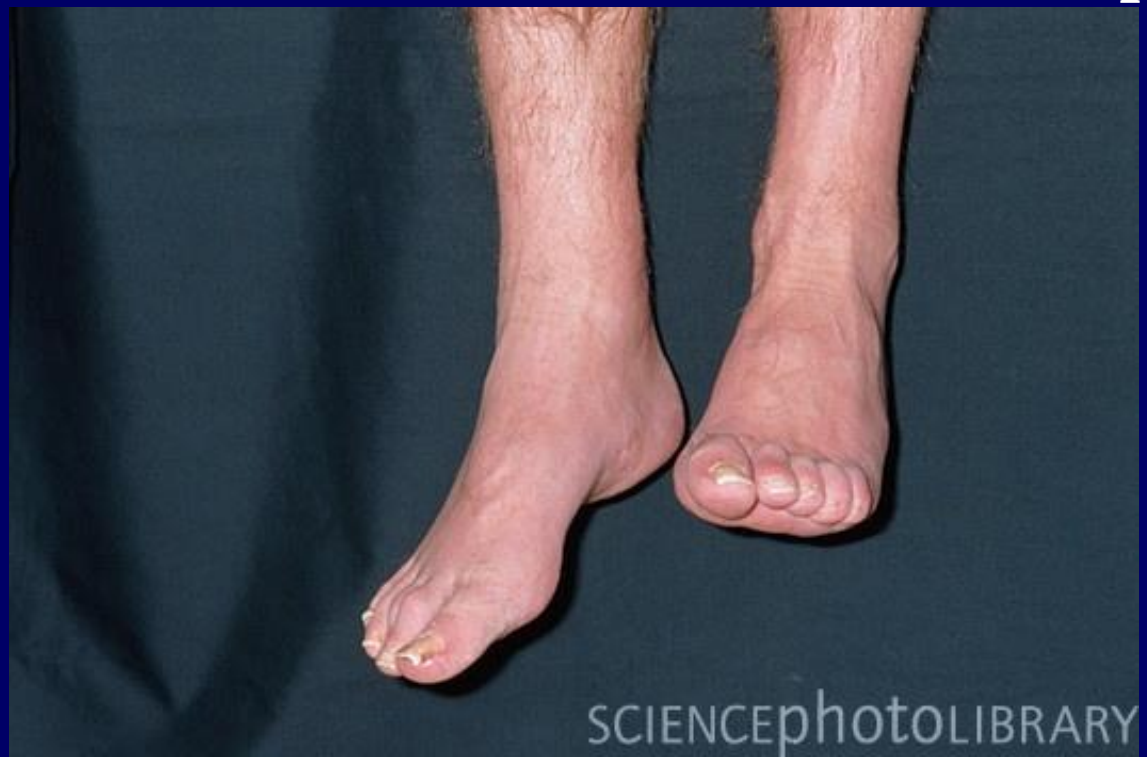
Compression

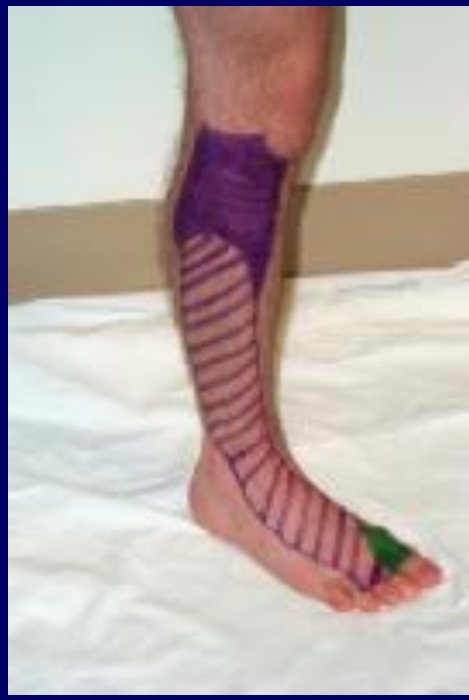
- **long lasting kneeling**
- **crossing of the leg**
- **plaster cast,**
- **fibrous band**

N. peroneus communis

Clinical features

Weakness	**dorsiflexion of leg and toes**
	steppage gait, footdrop
Sensory loss	**back of the leg**
	anterior-lateral aspect of sole





Polyneuropathies

Definition

Polyneuropathy refers to a disease characterized by widespread simultaneous involvement of the peripheral nerves.

Clinical characteristics

The polyneuropathies of many different etiologies have similar symptoms and signs.

	NEGATIVE	POSITIVE
Motor	**Weakness, Atrophy, Fatigue, Reduced muscle tone**	**Fasciculations, Cramps, Myokymia**
Reflex	**Reduced or absent (small fibre polyneuropathy - normal)**	**-------**
Sensory *Small fibre* *Large fibre*	**Decrease of pain and temperature sensation, Loss of visceral pain, Foot ulceration** **Decrease of vibration and proprioception, Reduction of touch-pressure sensibility, Sensory ataxia, Postural tremor**	**Spontaneous chronic and paroxysmal pain, Cutaneous hyperesthesia, Paresthesia (jabbing, shooting).** **Paresthesia (“tingling”, “pins-and-needles”),**
Autonomic ***Cardiovascular*** ***Gastrointestinal*** ***Urogenital*** ***Peripheral***	 **Orthostatic hypotension, Arrhythmia** **Gastroparesis, Constipation** **Impotence, Retrograde ejaculation, Urinary retention** **Decreased sweating, Hair changes**	 **Hypertension** **Neuropathic diarrhoea** **Osteoarthropathy**
Skeletal deformity	**Clawhand, Equinovarus position of foot, Hammer toe, Pes cavus, Spinal deformity**	

Most important causes of polyneuropathies

- **Hereditary**
- **Autoimmun**

GBS, CIDP, MMN

- **Infectious**

AIDS, Lyme disease, Leprosy, Diphtheria,

- **Nutritive**

B12, Folic acid, Thiamine deficiency,

- **Connective tissue diseases**

SLE, Sjögren's syndrome, Vasculitis, Scleroderma, Rheumatic arthritis, Hypereosinophilic syndrome

- **Toxic**

Drug induced, Heavy metals, Industrial and Agricultural chemicals

- **Metabolic**

Diabetes, Uremia, Alcoholism, Liver disease, Hypothyroidism, Thyrotoxicosis, Porphyria, Critically ill conditions

- **Dysproteinemic**

Monoclonal gammopathy, Macroglobulinemia, Amyloidosis, Multiple myeloma,

- **Malignancies**

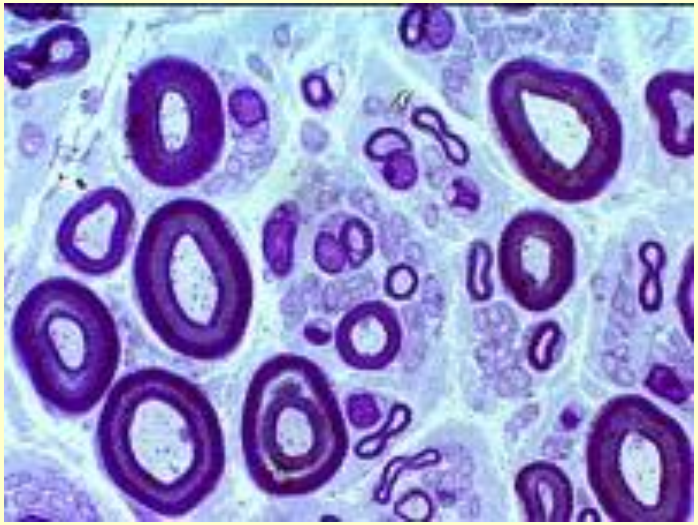
Clinical characteristics – Types of fibres involved

Motor	Sensory	Autonomic
MMN with conduction block	hereditary sensory neuropathy	acute pandysautonomia
drug (diaphenylsulfone)	B12 deficiency	paraneoplastic autonomic neuropathy
HMSN-s	B6 intoxication	
Guillain-Barré syndr. (axonal type -AMAN)	paraneoplastic	amyloidosis
	Sjögren syndrome	diabetes mellitus
CIDP	drugs (cysplatine, isonicide, thalidomide, adriamycin, hydralazine, chloromycetine)	idiopathic small-fiber neuropathy
critical illness pp.		
porphyria		
lead intoxication	diabetes	
drugs (vincristine, cytarabine, amiodarone, perhexiline)	leprosy	

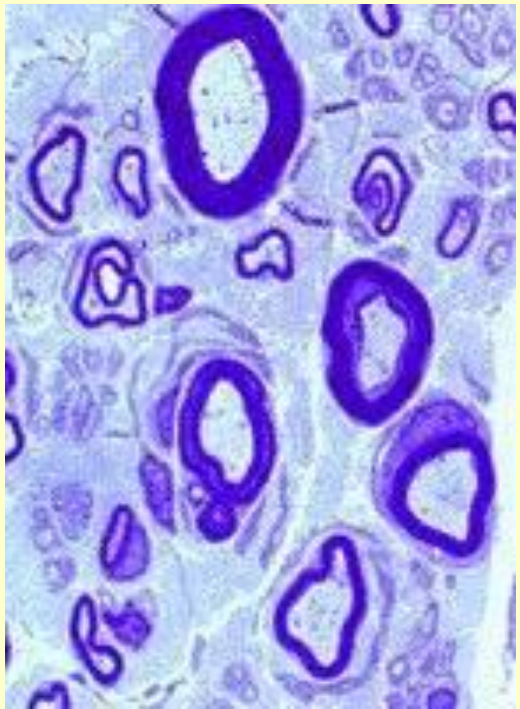
Pure, Predominantly

Pathology

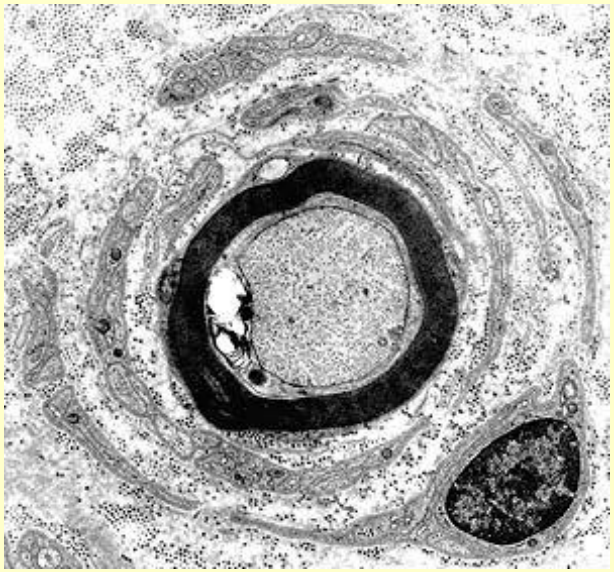
Normal



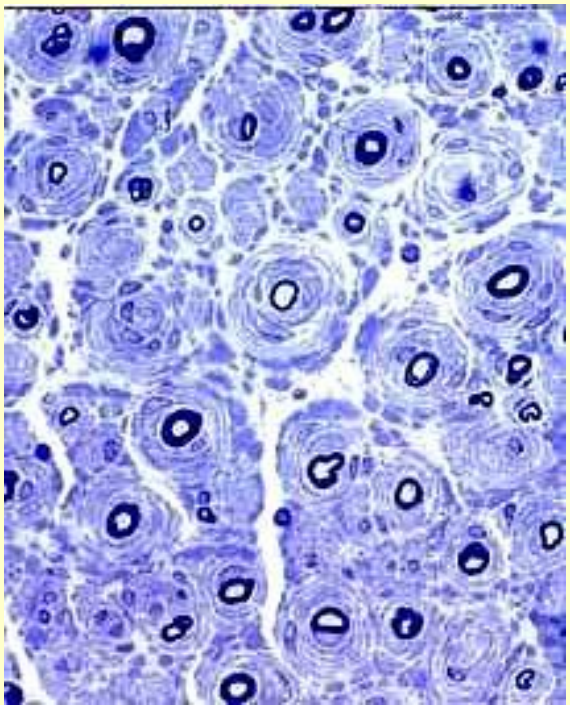
Early demyelinisation



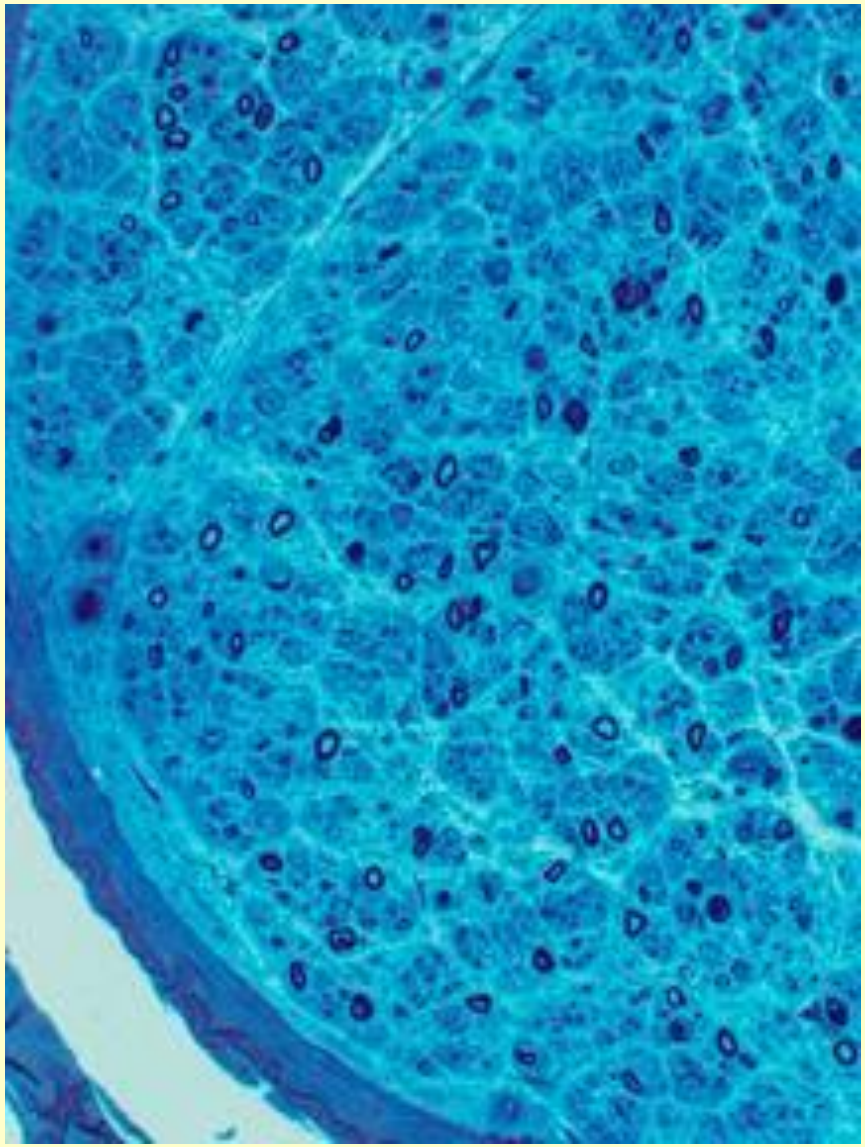
„onion bulb”



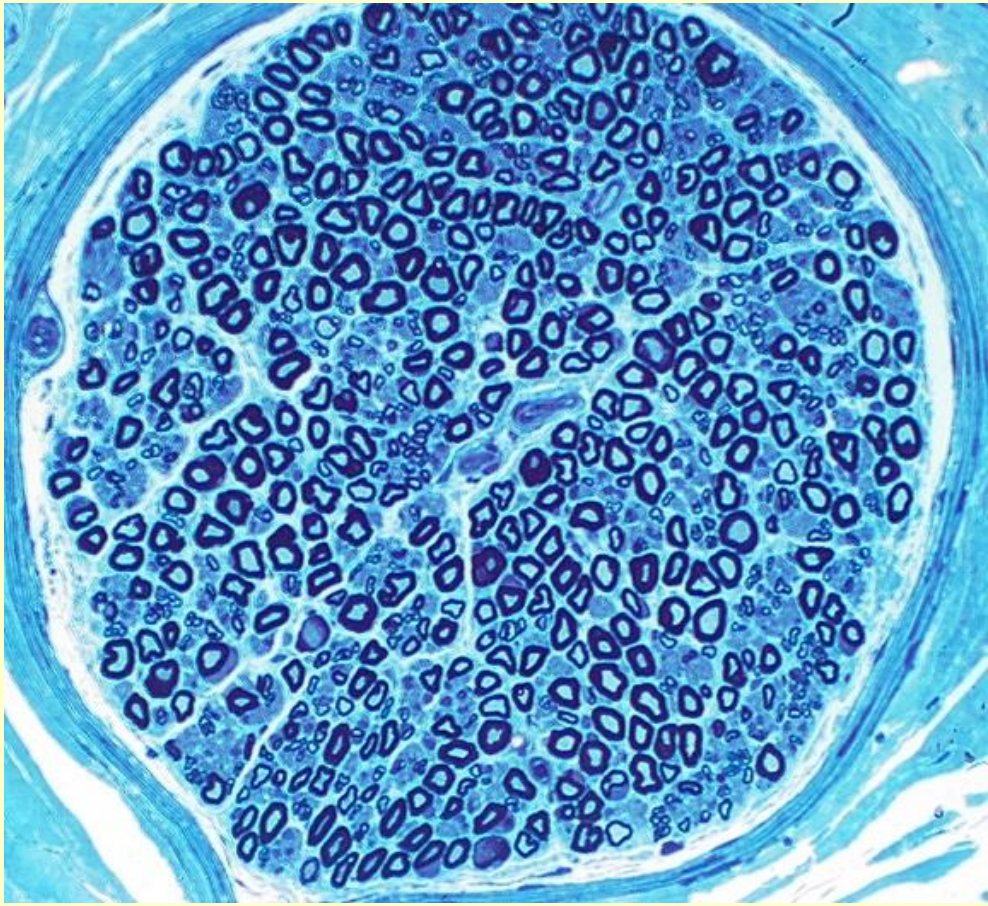
Pronounced demyelinisation „onion bulb”



Axonal lesion



Normal



Clinical signs and pathology

The clinical course/prognosis are determined by the underlying pathology.

Demyelinisation	Axonal lesion
• Acute and relapsing course,	• Acute and chronic progressive course
• Rapid and full recovery,	• Slow and generally incomplete recovery,
• Severe paresis,	• Severe paresis,
• Lack of significant atrophy,	• Prominent atrophy,
• Global areflexia,	• Achilles areflexia (patella, upper extremity reflexes are preserved),
• Motor signs are more pronounced,	• Significant sensory simptoms and signs.

Protocol of clinical evaluation

1. **Neurological examination including detailed history**
2. **Electrophysiological studies**
3. ***Laboratory examinations***
4. ***Genetic studies***
5. ***Histology***

The first two steps are the neurological examination and the electrophysiological studies.
They help to make a rational investigational program, the special studies can appropriately be applied only after these examinations.

	Locus	Gene product	Type of genetic lesion
CMT (Charcot-Marie-Tooth) type 1 (demyelinisation)			
CMT 1A	**17p11-12**	**PMP22**	**dupl/pm**
CMT 1B	**1q22-23**	**PMPO**	**pm**
CMTX	**Xq13**	**connexin 32**	**pm**
CMT type 2 (axonal)			
CMT 2A	**1p36**	**ismertlen**	**ismertlen**
CMT 2B	**3q**	**ismertlen**	**ismertlen**
HNPP	**17p11-12**	**PMP22**	**deletio**
CMT 3 (Dejerine-Sottas)	**17p11-12**	**PMP22**	**pm**

PMP22 = peripheriás myelin protein 22 kD
PMP0 = peripheriás myelin protein 0 (28 kD)
Cx32 = Connexin 32
HNPP = Hereditary neuropathy with liability to pressure palsies

Guilllain Barré Syndrome (GBS)

Georges Guillain

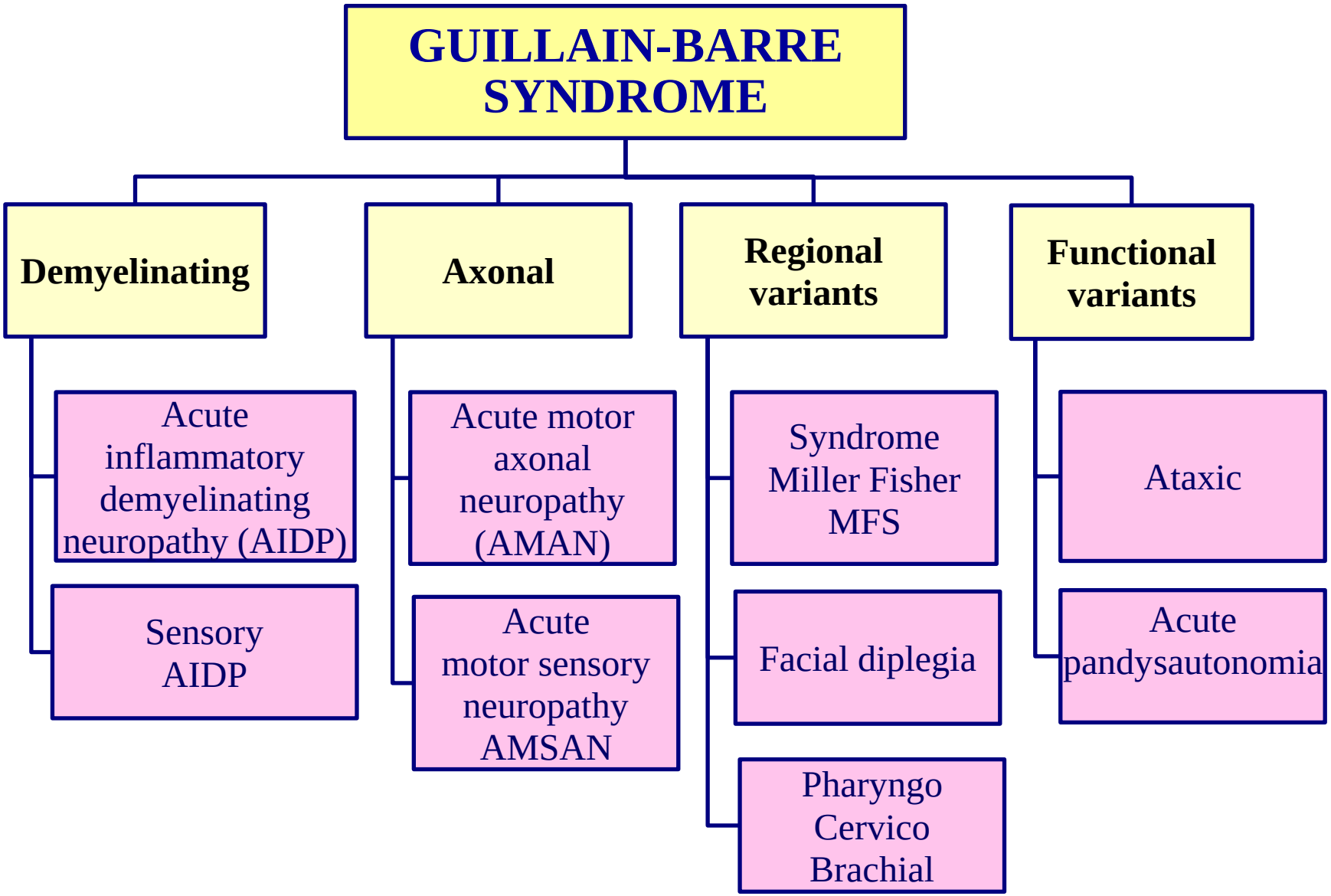
Jean-Alexandre Barré

André Strohl

Definition

Acute, autoimmune, polyradiculoneuropathy affecting the peripheral nervous system, usually triggered by an infectious process. It exhibits as an ascending paralysis in the legs that spreads to the upper limbs, face and respiratory muscles.

Variants of GBS syndrome



Epidemiology

- Relatively rare disorder:
  incidence:1 - 2 / 100.000

Antecedent events

- They usually occur 1 - 3 weeks before the onset of clinical symptoms.
- The most often reported is a benign upper respiratory or gastrointestinal infection (campylobacter jejuni)

Clinical Symptoms and Signs

Paresthesias

- Herald the onset of the disorder in at least 50% of patients
- Distal, symmetrical
- Spreads proximally but seldom extends beyond the ankles and wrists

Weakness

- Weakness is first noted a few days after the onset of paresthesias
- It begins in the lower extremities
- Ascends to the upper extremities

Diminished or absent deep tendon reflexes

- One of the earliest findings

Diagnostics

CSF analysis:

- Protein concentration: INCREASED
- Cell count: NORMAL

Electrophysiology:

- Nerve conduction studies

Prognosis

- Mortality: ~ 5 %
- Recover without serious neurological sequels ~ 75 %
- Recovery ensues over 6 to 12 months
- Permanent, substantial neurological sequels: ~ 7 - 15 %
  - Bilateral foot drop
  - Intrinsic hand muscle weakness and wasting
  - Sensory ataxia
  - Burning dysesthesias

Treatment

Specific therapy

- Plasmaexchange
- IvIg treatment

Supportive care

- Patients with suspected GBS should be hospitalized.
- ICU admissions occurs in ~ 30% of GBS patients.
- Major life-threatening complications:
  - Respiratory failure
  - Dysautonomia
  - Venous thromboembolism

Chronic inflammatory demyeliniating polyneuropathy- CIDP

Heterogenious group of polyneuropathies. Common features:

1. Immunmediated neuropathy.
2. Chronic progressive or relapsing course.
   Progressive phase: > 4 weeks
   Duration: > 2 months
3. Signs:
   - Symmetrical
   - Motor/Sensory
4. CSF: protein – cell dissociation.
5. Treatment:
   - Metilprednisolon
   - Immunglobulin
   - Plasmaexchange

Alcoholic polyneuropathy

- **Pathology:** **primary axonal neuropathy**
- **Cause:**
  - **impaired gastrointestinal absorption**
  - **Thiamine deficiency**
  - **Reduced aldehide dehydrogenase activity**
- **Lower extremities > Upper extremities**
- **Sensory signs:**
  distal burning paresthesias,
  diminished sensation with "stocking-to-glove" distribution.
- **Gait ataxia:** **difficulty walking, history of frequent falls.**
- **Motor signs:** **weakness of distal predominance**
- **Areflexia**
- **Therapy:** **abstinence**
  vitamin B1

Diabetic polyneuropathy

Aetiology

chronic hyperglycaemia

Classification

A. Diffuse Neuropathy

1. Distal symmetric sensory-motor pp.

2. Proximal symmetric motor pp. on the lower extremities

3. Autonomic neuropathy

B. Focal neuropathies

1. Cranial neuropathies

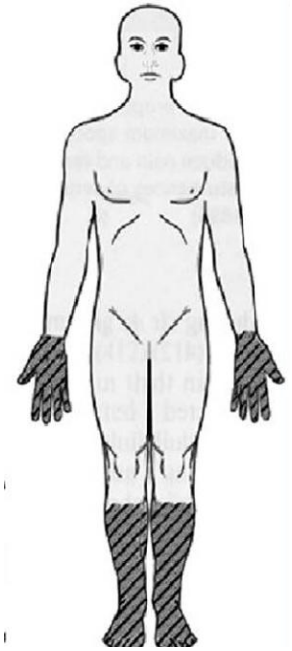
2. Radiculopathy/plexopathy

3. Entrapment neuropathies

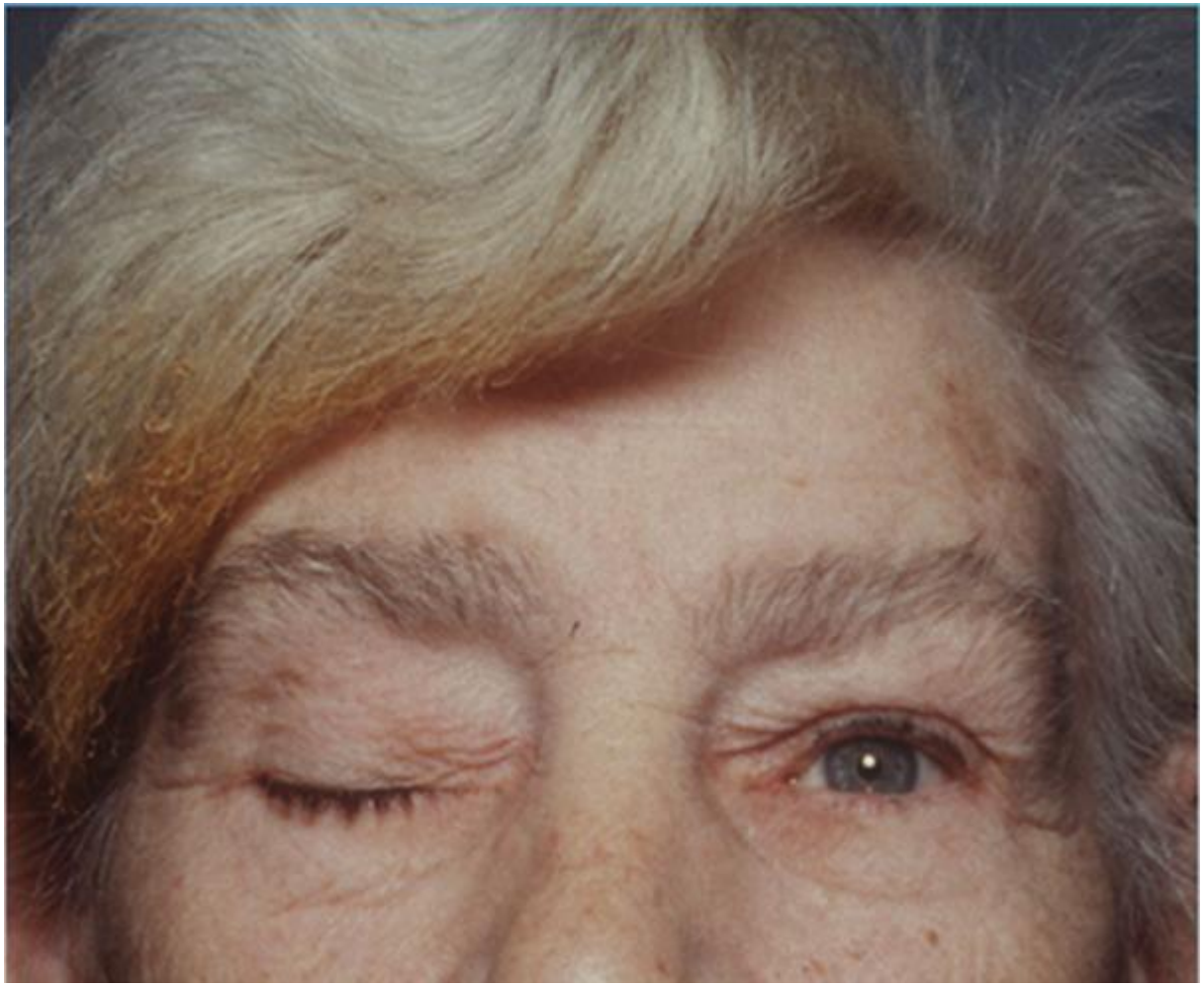
Clinical features

Most frequent form: distal symmetrical

- Sensory disturbances are the prevailing symptoms and signs.
- Glove and/or stocking like distribution of sensory loss
- Painful symptoms 30%
- Significant motor deficit is not common



Oculomotor neuropathy



Drug induced neuropathy

Clinical features	Gyógyszerek		
	Antimicrobic	Cytostatic	Cardiovasc.
Sensori neuropathy	Ethionamid Chloramphenicol Diamino substances	Procarbazin Nitrofurazon	
Paresthesia	Colistin Streptomycin Nalidixic acid	Cytarabin	Propranolol
Sensorimotor neuropathy	Isoniazid Streptomycin Nitrofurentoin	Vincristin Chlorabucil	Perhexilin Hydrallazin Clofirat
Dominanarly motor	Sulphonamidok Amphotericin		

Drug induced neuropathy

Clinical features	Drugs		
	Hypnotic	Antirheumatic	Others
Sensori neuropathy	Phenelsine		Sulfoxon Ergotamin Thiouracil Chlorpropamid
Paresthesia	Thalidomid Glutethimid Amitriptylin	Gold Indomethacin Ghloroquin Phenylbutazon	Methysergid Phenytoin Disulfiram Tolbutamid
Sensorimotor neuropathy	Imipramin		Chlorpropamid Dapson