Guillain-Barre Syndrome
A brief overview

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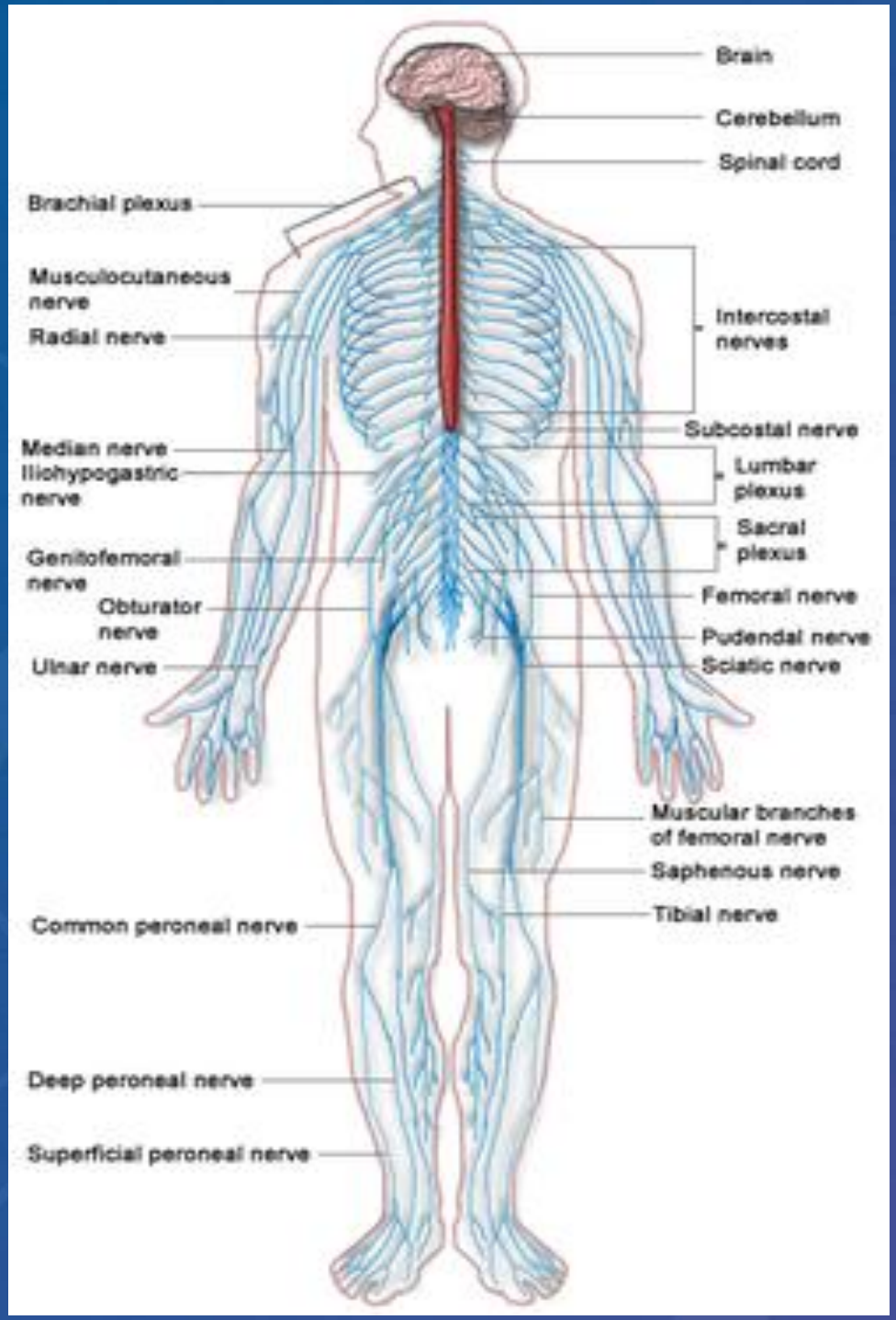
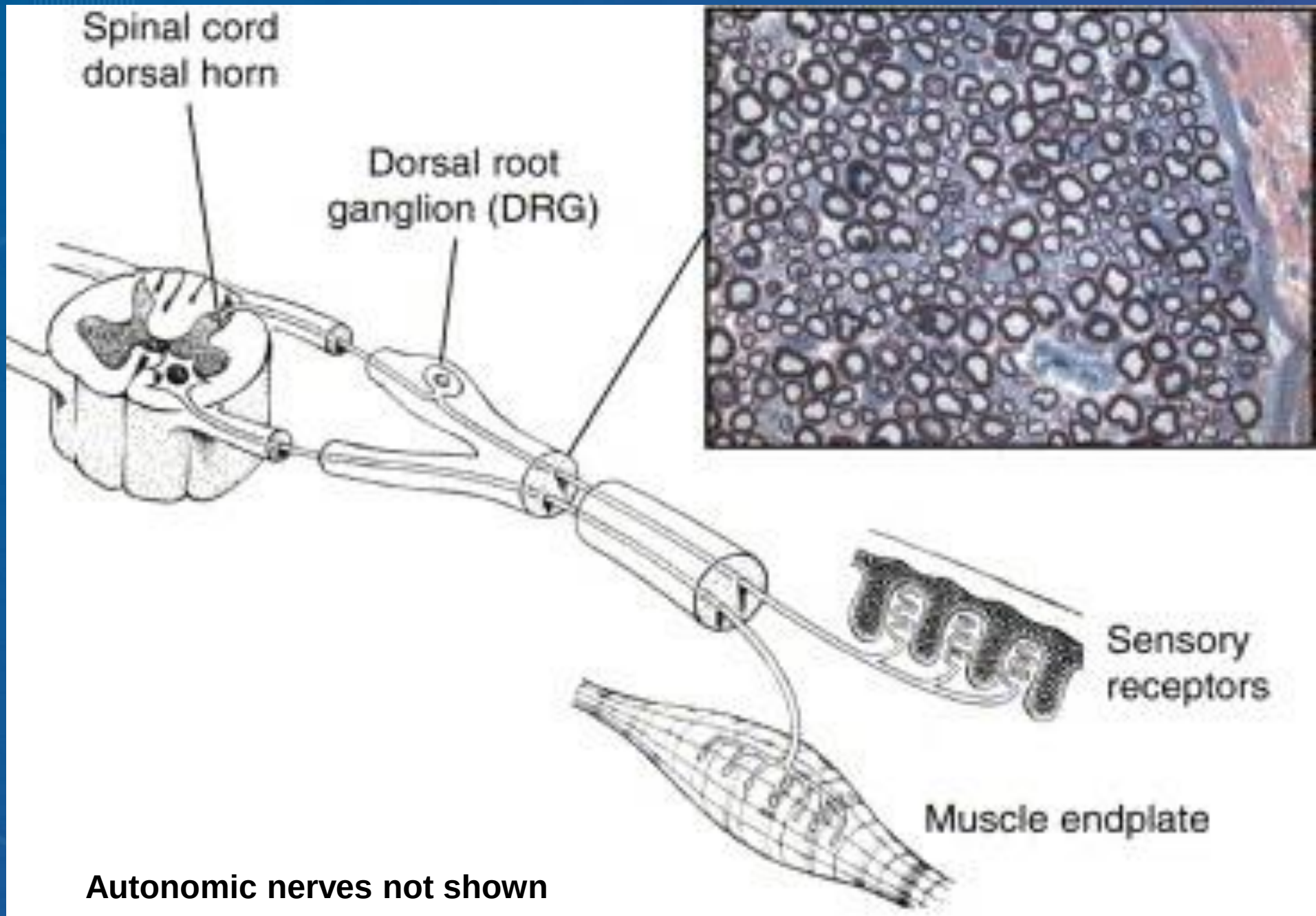
- What is GBS?
- What causes GBS?
- How does GBS affect you?
- How is GBS diagnosed?
- What is the treatment for GBS?
- What is the outcome after GBS?

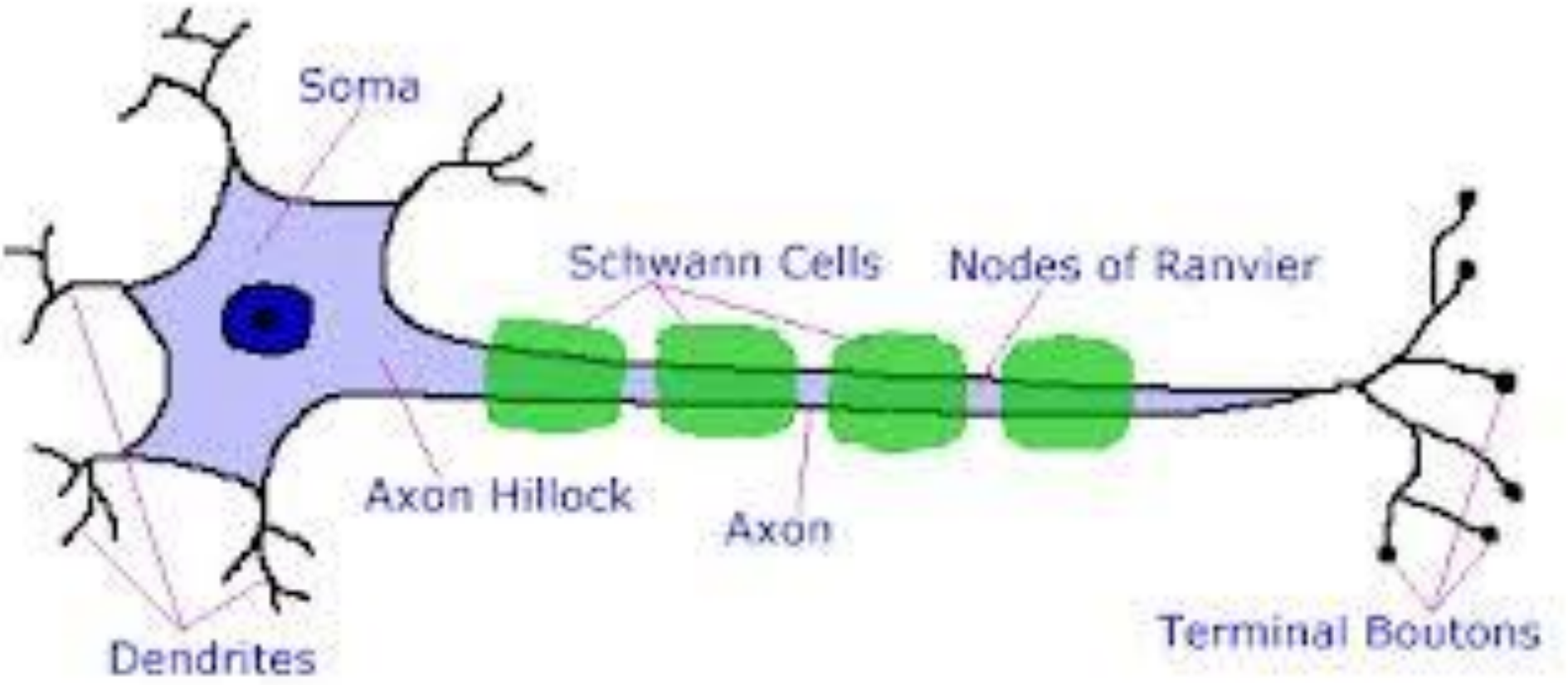
What is GBS?

- GBS is a neurological disease:
  - Peripheral neuropathy.
  - *Demyelination* vs. *Axonal degeneration*.
- GBS is an autoimmune disease.
- GBS is an inflammatory disease.


Brain
Cerebellum
Spinal cord
Brachial plexus
Musculocutaneous nerve
Radial nerve
Intercostal nerves
Subcostal nerve
Median nerve
Iliohypogastric nerve
Lumbar plexus
Sacral plexus
Genitofemoral nerve
Obturator nerve
Femoral nerve
Pudendal nerve
Ulnar nerve
Sciatic nerve
Muscular branches of femoral nerve
Saphenous nerve
Common peroneal nerve
Tibial nerve
Deep peroneal nerve
Superficial peroneal nerve



Autonomic nerves not shown


Soma
Schwann Cells
Nodes of Ranvier
Axon Hillock
Axon
Dendrites
Terminal Boutons

GBS as an autoimmune disease

- About 70% of GBS cases follow an identifiable triggering event, usually infection:
  - Commonest event is a respiratory infection (“flu”).
    - No relationship between the severity of the infection and the risk of developing GBS or its subsequent severity.
    - Infecting organism is seldom identified (CMV, mycoplasma)
  - Diarrhoea is the next most common antecedent event.
    - C. jejuni is the commonest identified cause of GBS overall.
  - GBS rarely occurs following vaccination.

GBS as an autoimmune disease

- The common thread that links these antecedent events is stimulation of the immune response.
- C. jejuni has been shown to share certain proteins with peripheral nerve proteins (antigens) and it is known that the immune response to the C. jejuni bacterium then involves the nerve because of this *“molecular mimicry”*.
- It is thought that the same mechanism may be operating following other infections but no common antigen has been found.

GBS as an inflammatory disease

- The effector cells of the immune response are the white blood cells which are the inflammatory cells that fight infections.
- Intense inflammation of peripheral nerves is the earliest pathological event in GBS.

How does GBS affect you?

- Many patients first notice mild sensory symptoms, usually distally; i.e., in the feet and/or hands.
- Weakness begins simultaneously or a day or two later and quickly comes to predominate.
  - Just as likely to be distal or proximal in the limbs
  - Usually affects legs first and ascends to the upper limbs
  - Rarely begins with bulbar muscles (face, speech and swallowing)
  - May begin with double vision due to weakness of eye muscles (MFS)
- Muscle cramps and fasciculations (twitching) may occasionally be noted.

Clinical presentation of GBS

- Early pain occurs in about 30% of patients.
  - Deep, aching, cramp-like pain
  - Located proximally (low back, between shoulder blades)
  - May be severe enough to need narcotics (rarely)
- Significant pain may distract from the diagnosis because of the (incorrect) perception that pain does not occur in GBS.
- Treatment of pain with narcotics may exacerbate respiratory symptoms.

Clinical presentation of GBS

- Autonomic nerves are frequently involved but usually asymptomatic:
  - Postural dizziness in those still standing/walking
  - Occasionally rapid and/or irregular heart beat may cause light-headedness
  - Abnormal sweating and temperature of the hands and feet
  - Difficulty urinating (ICU patients are almost always catheterized)
  - Constipation usually not manifest until after a week or so but early attention makes management easier
- Degree of autonomic involvement proportional to the severity of weakness.
- Although usually asymptomatic, autonomic involvement is an important cause of death in GBS patients.

Clinical presentation of GBS

Neurological examination:

- Confirms weakness.
- Sensory loss is absent or minimal.
- Rapid heart beat, particularly if also irregular, necessitates admission to ICU even if breathing is unaffected.
- *Absent or diminished reflexes are almost invariable and is a critical finding, even at the earliest stages of the disease.*

How is GBS diagnosed?

- Clinical suspicion
- EMG/NCS
- CSF examination
- Exclude other conditions in occasional atypical cases
- Lung function tests and ECG are not diagnostic tests but are critical for management.

Diagnosis of GBS

- Any patient presenting with these symptoms is easy to diagnosis.
- Delayed diagnosis is common, usually because all of the symptoms have not yet appeared.

Electromyography (EMG) and nerve conduction studies (NCS)

What is usually known as EMG is actually 2 separate procedures:

- NCS consists of administering electric shocks over the course of nerves and recording the responses from muscles (motor NCS) and from sensory nerves (sensory NCS).
- EMG consists of inserting needle into a number of muscles and recording electrical activity at rest and during contraction of the muscles.

Electromyography (EMG) and nerve conduction studies (NCS)

Motor NCS:

- Comprise the cornerstone on which an accurate diagnosis is based.
- Are used to classify the type of GBS:
  - AIDP in which the primary target is the myelin sheath
  - AMAN in which the primary target is the motor axon.
- Provide invaluable prognostic information:
  - Low amplitude (<10% of normal) of the motor response indicates a high probability of remaining chair or bed bound at a year.

Electromyography (EMG) and nerve conduction studies (NCS)

Motor NCS:

- Speed of conduction is slow in AIDP (<40m/sec in arms and <30 m/sec in legs).
- Conduction block in AIDP.
- Low amplitude responses indicate degree of axon loss:
  - Primary abnormality in AMAN.
  - Secondary axonal degeneration in AIDP.
- May be “normal” early in the course of the disease.
- Abnormalities may be patchy so multiple nerves need to be studied.
- Occasional need to repeat the study in non-diagnostic cases.

Electromyography (EMG) and nerve conduction studies (NCS)

Sensory NCS:

- Of little use in diagnosis of GBS.
- Primarily used to exclude other diagnoses:
  - Severe involvement of sensory nerves indicates a different diagnosis, particularly if motor NCS are normal.

Electromyography (EMG) and nerve conduction studies (NCS)

EMG:

- Of little use in diagnosis of GBS.
- May have some prognostic utility 2-3 weeks after onset of weakness in assessing severity of axon loss, particularly in proximal muscles.

Cerebrospinal fluid (CSF) examination

- CSF is the fluid that bathes the brain (*cerebrum*) and spinal cord.
- Nerve roots exiting the spinal cord traverse the CSF on their way to the limbs.
- The primary site of pathology in GBS is the nerve root and inflammation in nerve roots leads to protein leakage into the CSF, resulting in the characteristic high CSF protein.
- The inflammation remains largely confined to the nerve roots so inflammatory cells are not seen in significant numbers.
- This almost unique combination of high protein but few cells (albuminocytologic dissociation) led Guillain and colleagues to distinguish this condition from polio.

Cerebrospinal fluid (CSF) examination

- CSF is obtained by inserting a needle under local anesthetic into the lower spine, between vertebral the bones, and draining a small amount of the fluid.
- Despite urban myth, the procedure is:
  - Only minimally painful in most patients.
  - Never causes paralysis.
  - Rarely causes infection or hemorrhage.
- Causes headache in ~25% of patients which is severe in ~5%.

How is GBS treated?

- Most important treatment is supportive:
  - Even without specific immune therapy ~70% of GBS make a good recovery.
  - Prior to the development of good supportive care the mortality of GBS was about 25%

Supportive care in GBS

- Acute supportive care:
  - Support breathing
  - Prevent infections
  - Prevent blood clots
  - Pain management
  - Emotional support
- Chronic supportive care:
  - Physical therapy
  - Occupational therapy
  - Pain management
  - Emotional support

Immunotherapy in GBS

- Intravenous immunoglobulin (IVIg).
- Plasma exchange (PLEX).
- Do NOT use steroids.

Immunotherapy in GBS

- IVIg and PLEX about equally effective.
- IVIg easier to administer.
- IVIg may be safer (but not in major studies).
- Treatment does not prevent deterioration or improve mortality.
- Treatment accelerates recovery:
  - Less time in the hospital.
  - Less time in rehab.

What is the outcome after GBS?

- About 70% of patients fully recover strength.
- Typically takes several months but may take up to 2 years.
- Patients who recover slowly usually recover incompletely.
- About 55% to 80% of patients have long term residual fatigue.
- About 5% of patients die from the complications of GBS (pneumonia, pulmonary embolism, cardiac arrhythmia).