

# Spinal Cord - somatic motor system (motor units)

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**Motor unit** (Charles Sherrington, 1925) - the basic unit of motor function - a **motor neuron** + the **group of muscle fibers it innervates**

- number of muscle fibers innervated by a single motor neuron varies widely - depending on the dexterity of the movements controlled and the mass of the body part to be moved:
  - motor units with < 100 muscle fibers finely control eye movements
  - single motor unit in the leg contains up to 1,000 muscle fibers.

Classification of the four types of motor unit disorders (all lead to muscle weakness):

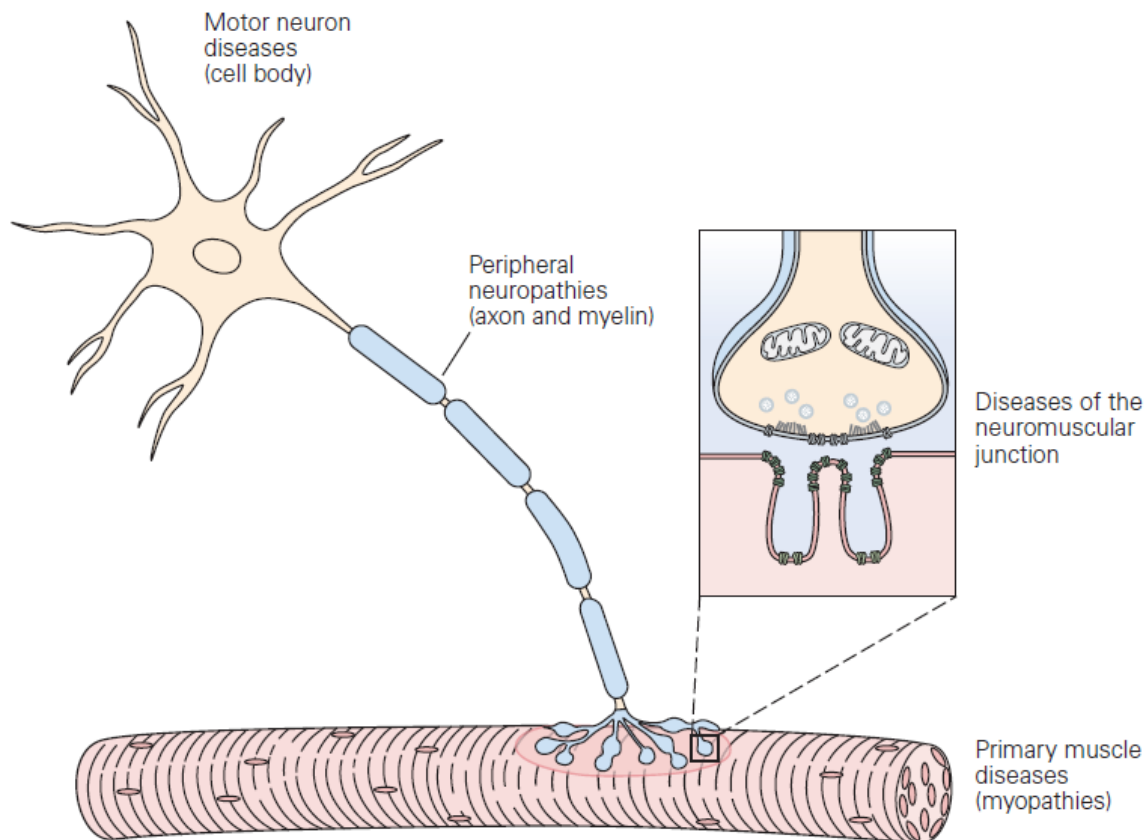


Table 14-3 Differential Diagnosis of Disorders of the Motor Unit

Finding	Nerve	Neuromuscular junction	Muscle
<b>Clinical</b>			
Weakness	++	+	++
Wasting	++	-	+
Fasciculations	+	-	-
Cramps	+	-	+/-
Sensory loss	+/-	-	-
Hyperreflexia, Babinski	+ (ALS)	-	-
<b>Laboratory</b>			
Elevated serum CPK	-	-	++
Elevated cerebrospinal fluid protein	+/-	-	-
Slowed nerve conduction	+	-	-
Response to repetitive stimulation	Normal	Decremental (MG) Incremental (LEMS)	Normal
<b>Electromyography</b>			
Fibrillation, fasciculation	++	-	+/-
Duration of potentials	Increased	Normal	Decreased
Amplitude of potentials	Increased	Normal	Decreased
<b>Muscle Biopsy</b>			
Isolated fiber atrophy	++	Normal	+/-
Grouped fiber atrophy	++	Normal	Normal
Muscle necrosis	Normal	Normal	++

ALS, amyotrophic lateral sclerosis; CPK, creatine phosphokinase; LEMS, Lambert-Eaton myasthenic syndrome; MG, myasthenia gravis.

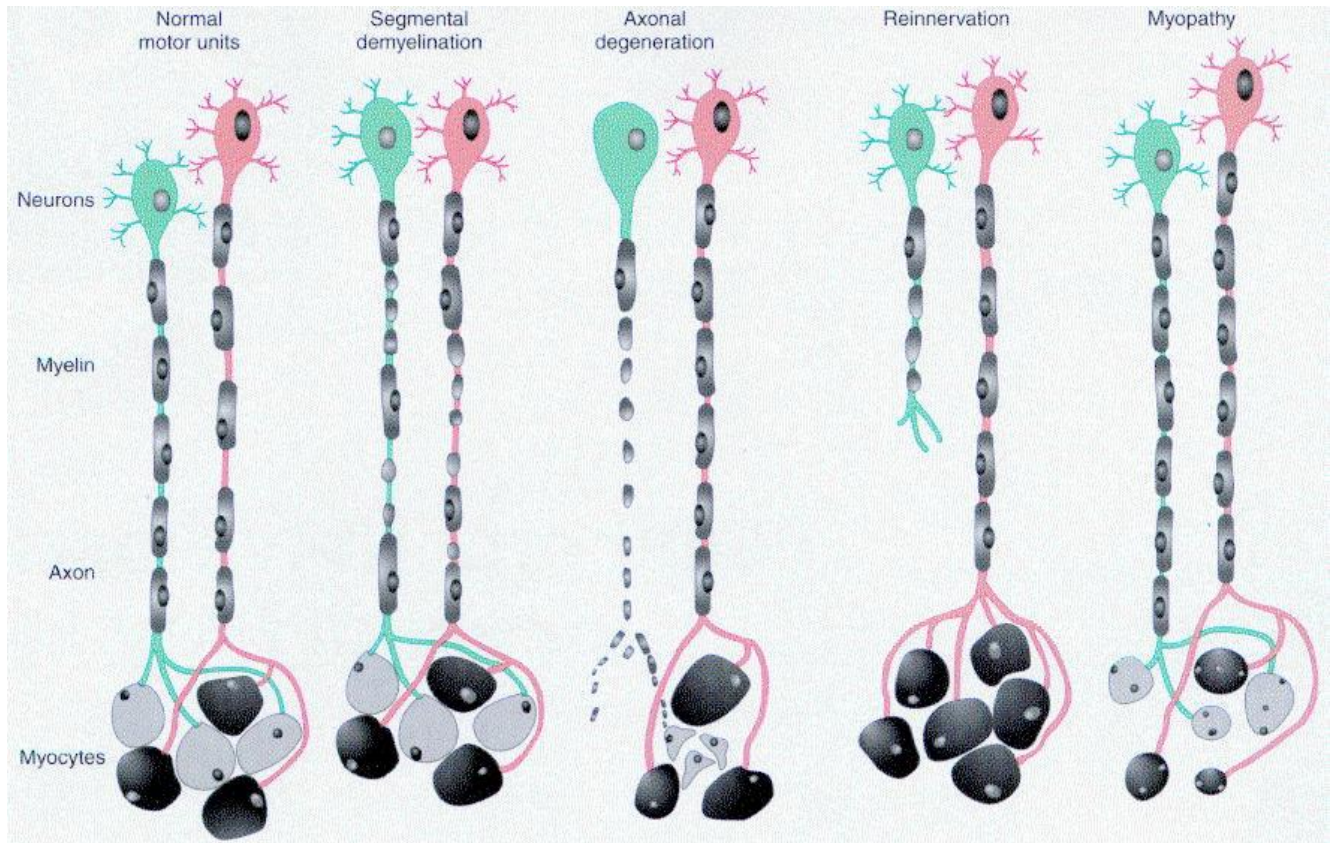
**Normal and abnormal motor units** (two adjacent units are shown):

**Segmental demyelination:** random myelin internodes are injured and are remyelinated by multiple Schwann cells, while axon and myocytes remain intact.

**Axonal degeneration:** axon and its myelin sheath undergo anterograde degeneration (shown for green neuron) → denervation atrophy of myocytes within its motor unit.

**Reinnervation of muscle:** sprouting of adjacent (red) uninjured motor axons leads to fiber type grouping of myocytes, while injured axon attempts axonal sprouting.

**Myopathy:** scattered myocytes of adjacent motor units are small (degenerated or regenerated), whereas neurons and nerve fibers are normal.



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