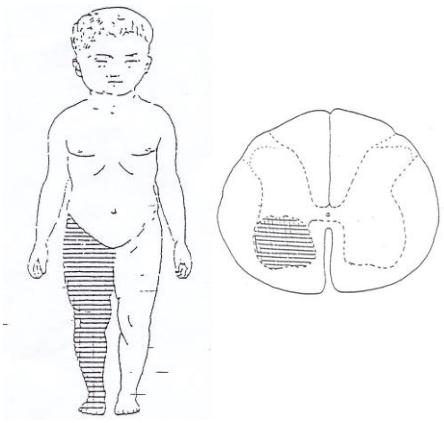
Unit VIII – Problem 2 – Physiology: Spinal Cord Lesions

CASE-1: POLIOMYELITIS

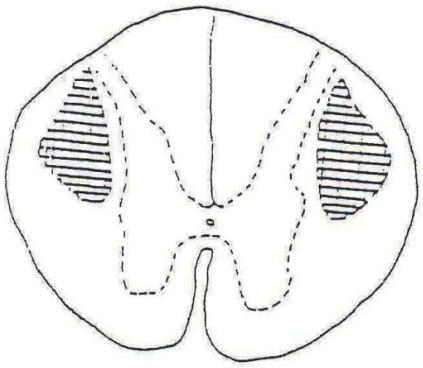
- **How does the patient present?**
  - A child coming from a country in which the disease is prevalent.
  - Paralysis of one of the lower limbs with features of lower motor neuron lesion:
    - ✓ Hypotonia.
    - ✓ Hyporeflexia.
  - Notice that there will be no sensory loss (why?) → because this is a lower motor neuron lesion occurring in the ventral grey horn of the spinal cord at the same side (ipsilateral) and not affecting the ascending (sensory) tracts such as the dorsal column and spinothalamic tract.
  - Patient's history of vaccination is vague.



- **Investigation**: EMG shows (increased insertional activity, presence of spontaneous activity, MUAPs are large known as giant waves, recruitment is reduced).

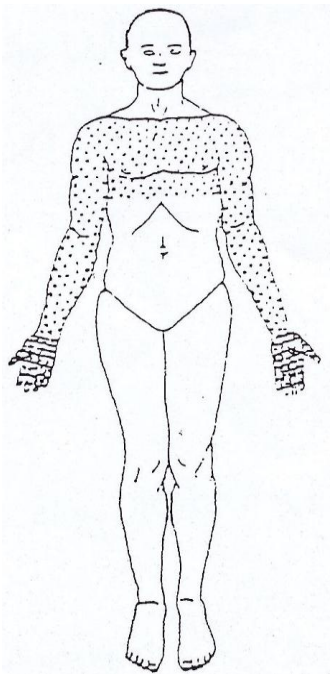
CASE-2: LATERAL SCLEROSIS

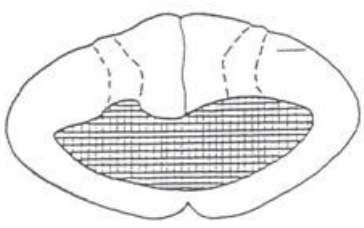
- **How does the patient present?**
  - Adult presenting with features of upper motor neuron lesion affecting both lower limbs:
    - ✓ Hypertonia of both lower limbs (stiffness).
    - ✓ Hyper-reflexia.
    - ✓ No muscle wasting.
    - ✓ (+) Babinski's sign with clonus.
  - Notice that sensation is not affected (why?) → because the sensory pathways of the spinal cord (dorsal column and spinothalamic tracts) will not be affected.
  - The lesion is affecting the lateral corticospinal tract bilaterally (at both sides: right and left).

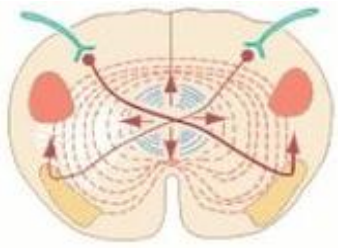


CASE-3: SYRINGOMYELIA

- **How does the patient present?**
  - Bilateral loss of pain and temperature in both upper limbs and thorax.
  - Preservation of fine touch, vibration and proprioception.
  - Weakness and atrophy of small muscles in hands (note: when the question mentions that small muscles of the hand are affected → suspect that the lesion is at the level of C8-T1 spinal cord segments: lower motor neuron lesion).
- **Syringomyelia**: cavity formation which extends anteriorly from the central canal of the spinal cord and affecting the crossing fibers of spinothalamic tract. The lesion might also involve the ventral horn of the spinal cord resulting in a lower motor neuron lesion at the level of the segment affected.

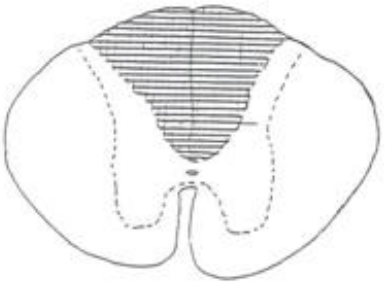






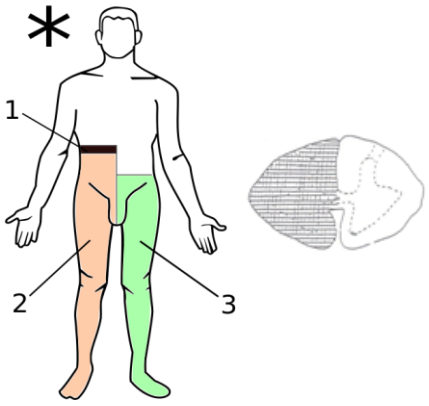
CASE-4: TABES DORSALIS (OR CAN BE VITAMIN B12 DEFICIENCY)

- **How does the patient present?**
  - Sensory ataxia: which is examined clinically by Romberg's test.
  - Loss of posture sense, fine touch, vibration and 2-point discrimination (why?) → because tabes dorsalis leads to destruction of the posterior white column of the spinal cord (therefore, dorsal column will be affected).
  - No loss of pain and temperature.
  - There might be hyporeflexia (when?) → if there is interruption of the afferent part of the reflex which is coming from muscle spindle.



CASE-5: BROWN-SEQUARD SYNDROME

- **How does the patient present? Suppose the damage is on the right side (right side hemisection of the spinal cord)**
  - Lower motor neuron lesion at the right side (ipsilateral) at the level of the damage.
  - Upper motor neuron lesion at the right side (ipsilateral) below the level of the damage.
  - Loss of dorsal column sensations at the right side (ipsilateral) below the level of the damage.
  - Loss of pain and temperature at the left side (contralateral) 2-3 segments below the level of the damage.



CASE-6: GUILLAIN-BARRE SYNDROME (GBS):

- **How does the patient present?**
  - The patient has a history of acute infection nearly 2 weeks before the presentation (infection is mostly with C.jejuni or cytomegalovirus).
  - Paralysis of both limb muscles (this syndrome is an autoimmune reaction in which demyelination of peripheral nerves occurs in an ascending manner. In other words, paralysis usually starts distally and extends proximally in progressive continuous fashion).
  - Paralysis of facial muscles.
  - Lower motor neuron lesion features:
    - ✓ Hypotonia.
    - ✓ Hyporefleexia.
  - Weakness of respiratory muscles (this needs immediate intervention with artificial respiration).
  - Decrease of all modalities of sensations in affected limbs (due to generalized peripheral neuropathy).
- **Investigations:**
  - Lumbar puncture which will reveal increased level of protein in cerebrospinal fluid.
  - Nerve conduction studies: reduced sensory and motor nerve conduction velocities (due to demyelination).

CASE-7: MYESTHENIA GRAVIS

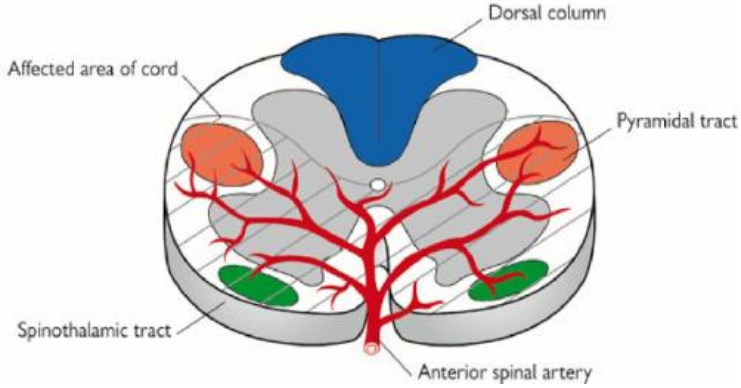
- **How does the patient present?**
  - Muscle weakness/fatigability especially late in the afternoon (not in the morning).
  - Weakness of facial muscles and ptosis. Ptosis can be found with:
    - ✓ Paralysis of oculomotor nerve – pupil dilated.

- ✓ Myasthenia gravis – normal pupil.
- ✓ Horner's syndrome – pupil constricted.

- **Investigations:**
  - Anti Ach-receptor antibodies are detected in patient's blood.
  - EMG: it shows decreased amplitude of motor unit action potentials (MUAPs) after repeated stimulation.
  - A pharmacological test which is useful for diagnosis of this condition is: tensilon test.

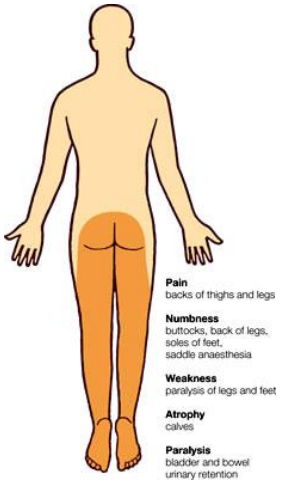
CASE-8: ANTERIOR CORD SYNDROME (INFARCTION OF ANTERIOR SPINAL ARTERY)

- **How does the patient present?**
  - Anterior spinal artery is supplying the anterior 2/3 of the spinal cord. It might be blocked by a thrombi disseminated from the left atrium (patient is presenting with a history of atrial fibrillation).
  - Loss of pain and temperature bilaterally below the level of lesion.
  - Sparing of dorsal column sensations (why?) → because it is supplied by the posterior spinal arteries.
  - There are upper motor neuron lesion features below the level of the lesion.



CASE-9: CAUDA EQUINA SYNDROME

- **How does the patient present?**
  - Lower back ache.
  - Saddle-type anesthesia.
  - Diminished/lost reflexes of lower limbs + Muscle weakness in lower limbs: indicating a lower motor neuron lesion.
  - Urinary incontinence and poor anal sphincter tone: the sacral part of parasympathetic nervous system is affected.



CASE-10: COMPLETE SECTION OF SPINAL CORD WITH HORNER'S SYNDROME

- **How does the patient present? Suppose the lesion is at the level of C5**
  - Complete paralysis of the body below the level of the lesion (quadriplegia) → all ascending and descending tracts will be affected. In addition, autonomic function will be affected.
  - Horner's syndrome is characterized by the triad of:
    - ✓ Miosis (constricted pupil).
    - ✓ Partial ptosis.
    - ✓ Loss of hemifacial sweating (anhidrosis).