Objectives

- Emphasize the importance and ubiquity of acute peripheral neurological problems
- Provide an overview of the most common peripheral nerve and muscle disorders
- Discuss symptoms and signs that can help identify neuropathies from myopathies, large fiber versus small fiber
- Provide an overview of some acute neuromuscular problems, that may include: peripheral neuropathy (diabetic, CMT), Guillain-Barre, myasthenia gravis, botulinum, carpal tunnel syndrome, facial nerve palsy, ALS, Duchene muscular dystrophy, dermatomyositis

The Motor Unit

- Anterior horn cell (neuronopathy)
- Nerve fiber (neuropathy)
- Neuromuscular junction (myasthenia)
- Muscle fibers (myopathy)

Symptoms of All Motor Unit Disorders

- Weakness: Failure to achieve a maximal force (strength)
- Fatigue: Failure to maintain an expected force (endurance)
Endurance

• Maximal contraction can not be maintained (physiological mechanism)

• Most sustained effort is 20-30% of maximal (training, motivation, genetic)

Patterns of Weakness

• Neuronopathy: Proximal or distal, often asymmetrical

• Polyneuropathy: Distal and symmetrical

• Myopathy: Proximal and symmetrical

• Myasthenia: Cranial nerves

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Functional Strength Testing

• Face: Hold air in mouth, forced lid closure

• Eyes: Range of motion

• Hips: Rise from floor

• Legs: Walk on toes and heels

• Arms: Push-ups, touch ipsilateral shoulder blade, hand grasp

Deep Tendon Reflexes

• Neuronopathy: Depressed in proportion to weakness.

• Neuropathy: Depressed out-of-proportion to weakness.

• Myasthenia: Preserved, may be fatigued.

• Myopathy: Depressed in proportion to weakness.

Other Features

• Sensory features: only in neuropathy

• Autonomic features: neuropathy or myasthenia

• Atrophy: not in myasthenia

• Myotonia: channelopathies

• Hypotonia: can be caused by disorders of the CNS or PNS, not usually by myasthenia
Case

An 18 year old man, 2 days ago started to develop weakness in both feet, since he first noticed it, the weakness has ascended to the lower abdomen. He is now unable to ambulate. Recalls an episode of diarrhea about 2 weeks ago.

On exam, has 2-3/5 weakness in lower extremities, 4/5 in the upper extremities.

He is able to lift the head up off the pillow.

CSF shows 0-1 cells with proteins of 82 mg/dL

• Where should this patient be admitted?
• What therapeutic options are available?

Guillain-Barre(-Strohl) Syndrome (AIDP)

• Ascending, symmetric, subacute (days) weakness; may have back pain, and distal paresthesias
• About 1/3 require mechanical ventilation
• Parainfectious: C. jejuni, M. pneumoniae, CMV, EBV, HIV, Hep A, others
• Loss of DTRs
• CSF: albumino-cytologic dissociation
• Treatment: supportive, PLEX, IVIG (NOT steroids)
• Miller-Fisher variant

Neuronopathies

• Spinal muscular atrophies
• Amyotrophic lateral sclerosis
• Vaccine associated paralytic poliomyelitis (VAPP)
• Other enteroviruses

Polyneuropathies

• Hereditary
  • Structural proteins (eg. CMT, HSMN)
  • Inborn errors of metabolism
  • Mitochondrial disorders
• Systemic disorders (eg. DM, POEMS)
• Drugs and toxins (eg. B1 def, B6 excess)
• Immune-mediated (eg. vasculitis)

Case

A 64 year old woman complaints of gradual onset of weakness over the last 5-6 months that seems to worsen after physical activities. She has noted that even her eyelids droop, limiting her vision when she watches TV at night. Today, she is brought to the ER with pronounced diffuse weakness, unable to fill her cheeks with air (air leaks through her lips) and is unable to lift her head up from the pillow. Her breathing is shallow and rapid. Her mentalation, sensory exam and DTRs seem preserved.

• What is your differential diagnosis?
• What is acutely happening her?
• Where should she be admitted?
• What do you do to safely feed her?
Neuromuscular Failure

- Can lead to fatal respiratory insufficiency or arrest
- Acute or subacute presentation suggests Guillain-Barré (GBS), myasthenia gravis, or toxins
- May be precipitated by infections (UTI) or drugs (gentamycin, procaine, others)
- Careful about that patient that can not keep the head lifted off the bed, or has facial diplegia
- Pulse ox can fool you, get an ABG
- Consider getting a NIF (negative inspiratory force)
- May be precipitated by infections (UTI) or drugs (gentamycin, procaine, others)
- Keep patient NPO, until swallowing is assessed and proved to be safe
- Consider DVT prophylaxis early

Diagnosis and Therapy

- EMG, Edrophonium (Tensilon®) test
- CXR for baseline, look for aspiration, look for mediastinal mass
- Specific lab tests: anti-AchR, anti-striational, anti-GM1, anti-GD1b, anti-MuSK Abs
- IVIg vs. PLEX for GBS and MG
- Steroids for MG (azathioprine, cyclosporine)
- Pyridostigmine (Mestinon®)
- What is 3,4 dianaminopyridine used for?

Case

- A 40 year old female complaints of nocturnal left hand pain and paresthesias, on occasions all the way up into the arm. She has noted that driving or reading the newspaper may aggravate the symptoms. She has mild weakness on her grip strength. Sometimes “shaking it off” or “rubbing it off” may improve the symptoms. On exam, Tinel’s and Phalen’s tests are positive, and has mild atrophy of the left tenar eminence.

Carpal Tunnel Syndrome

- Females are 3X more likely than men
- Causes: congenitally small carpal tunnel, repetitive hand activity, RA, fractures, pregnancy, hypothyroidism, acromegaly, amyloid, etc
- Begins in dominant hand, later bilateral
- On NCS: slow sensory conduction across carpal ligament
- Work up: thyroid function, ESR, glycemia, CBC
- Consider C7 radiculopathy in the diff diagnosis

Mononeuropathies

- Trauma (eg. sports, surgery)
- Vasculitis (eg. SLE, Behcet’s)
- Immune-mediated (eg cryoglobulinemia)
- Hereditary tendency for pressure palsies – PMP-22 mutation

Acquired Myopathies

- Inflammatory
- Toxic
Inflammatory Myopathies

- Polymyositis (PM)
- Dermatomyositis (DM)
  - Assoc cancers: ovarian, lung, pancreatic
  - Skin lesions: Heliotrope, Gottron’s, violaceous macules
- Inclusion body myositis

Toxic Myopathies

- Mitochondrial (e.g. MELAS)
- Myosin deficient myopathy
- Rhabdomyolysis
  - Statins
  - Ethanol, cocaine
  - Cyclosporine

Genetic Myopathies

- Disturbances of muscle cell integrity during contraction (dystrophies, like Duchene MD)
- Disturbances of the energy for contraction (glucose, lipids, ATP)
- Myotonias (channelopathies)
- Congenital myopathies

Laboratory Studies

- Serum creatine kinase (CK)
- Electrodagnosis
  - Electromyography (EMG)
  - Repetitive stimulation
  - Nerve conduction studies (NCS)
- Muscle biopsy
- Nerve biopsy

Laboratory Studies

- Edrophonium chloride (Tensilon®)
- Antibodies
  - Myasthenia panel
  - Neuropathy panel
- Molecular genetics
- Exercise testing
- Other imaging: MR, ultrasound

What is depicted in the picture below? Where is it seen?
Extra “points” question!!!!

• What clinical condition is depicted in this photograph?

Fascio-Scapulo-Humeral Atrophy

• Autonomic dominant, 4q35, 95% penetrance
• 3rd most common dystrophy after Duchene and myotonic
• Variable symptom severity
• 90% weak by age 20
• Weakness in face, shoulder, pelvic girdle (scapular winging)
• Spares extraocular, pharyngeal, lingual and cardiac muscles
• Hearing loss and retinal abnormalities have been reported

Questions? Comments?

Thank you!