Case #1: A Difficult Diagnosis

- A 70M presents to the ED with increasing cough and SOB and is intubated for increased work of breathing
- A RML infiltrate is seen on CXR
- Further history suggests “failure to thrive” with increasing difficulties walking and swallowing over the past 5 months
Neurological Examination

• Why perform a neurologic examination in this setting?
• MS: Normal
• CN: Mild bifacial weakness (difficult)
• Motor: Atrophy of intrinsic hand muscles. Moderate weakness in all four limbs diffusely. Minimal fasciculations seen

Neurological Examination (con’t)

• Sensory: Normal
• Reflexes: 2+ in RUE, 3+ in LUE, Patellars 3+ B, absent at ankles.
<table>
<thead>
<tr>
<th>Pattern of Weakness</th>
<th>UMN</th>
<th>LMN</th>
</tr>
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<tbody>
<tr>
<td>Pyramidal</td>
<td></td>
<td>Variable</td>
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<table>
<thead>
<tr>
<th>Function/Dexterity</th>
<th>UMN</th>
<th>LMN</th>
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<tbody>
<tr>
<td>Slow alternate motion rate</td>
<td></td>
<td>Impairment of function is mostly due to weakness</td>
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<table>
<thead>
<tr>
<th>Tone</th>
<th>UMN</th>
<th>LMN</th>
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<tbody>
<tr>
<td>Increased</td>
<td></td>
<td>Decreased</td>
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<table>
<thead>
<tr>
<th>Tendon Reflex</th>
<th>UMN</th>
<th>LMN</th>
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<tbody>
<tr>
<td>Increased</td>
<td></td>
<td>Decreased, absent or normal</td>
</tr>
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<table>
<thead>
<tr>
<th>Other signs</th>
<th>UMN</th>
<th>LMN</th>
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<tbody>
<tr>
<td>Babinski sign, other CNS signs (e.g. aphasia, visual field cut)</td>
<td></td>
<td>Atrophy (except with problem of neuromuscular junction)</td>
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An underutilized cheap test that can be lifesaving

- The admitting physician, prior to intubation, asked RT to come to bedside to measure a Forced Vital Capacity (FVC) and Maximal Inspiratory Force (MIF)
  - FVC 1.2L, MIF -20
- Check in all patients with suspected neuromuscular weakness including all with weakness of all four limbs
- Caveats: seal, participation
Amyotrophic Lateral Sclerosis

- Combination of UMN and LMN signs on exam
  - Fasciculations not specific for ALS
- Bulbar musculature including respiratory and swallowing often involved
  - Poor pulmonary toilet and aspiration: PNA
- Rare: 1-3/100,000; only 10% familial
- Many patients have delayed diagnosis
- Diagnosis can be made clinically but EMG/NCS is gold standard
  - Allows for rare mimics to be addressed as well

Inpatient Management Issues

- 1. Recognition and making diagnosis
- 2. Prognosis
  - Majority die within 5 years
  - 10-20% survive longer than 10 years
- For established patients….
  - 1. Ventilatory failure risk: Frequent MIF/FVC
  - 2. Higher risk of PNA and aspiration: Consider PEG early
  - 3. Disease modifying meds: Riluzole minimally effective
  - 4. Multidisciplinary care team is key
Additional (Bigger) Ventilation Issues

- Nighttime BiPap often advised
  - Screen for morning headaches, confusion, increased symptoms
  - Baseline PFTs
- Consider non-invasive ventilation first
- Important discussion regarding trach
  - Only around 10% choose trach
    - Placement issues: resources needs to be at home are great
  - Communication issues for discussion and GOCs
    - Most cognitively normal***

Organ Donation: It Comes Up

- Hot topic in ethics currently
- Multiple case reports and series have been published

Case #2

• A 63yo man comes to the ED with 3 days of inability to walk. The patient reports a 2 week history of tingling in his hands and feet while also stating that he has been stumbling while walking for five days.

Case #2

• Exam
  – General exam nl with stable vitals
  – Mental status, cranial nerves normal
  – Motor exam with mild-moderate symmetric weakness prox>distal in the upper ext., distal>prox in the LEs
  – Sensory exam completely normal
  – Reflexes 1 throughout except 0 ankles, plantar response flexor bilaterally
Case #2: Additional Tests

FVC/MIF: 1.1L, -30

Lumbar Puncture: Opening pressure normal, 2 WBC, Zero RBC, Protein 87, Glucose normal

Guillain Barre Syndrome: Key Points

• Clinically must think in the setting of paresthesias and weakness
  – Normal sensory exam, weakness not always ascending
  – Areflexia the rule, but not early in the disease
  – High protein with no cells on LP the rule, but not early in the disease
• EMG/NCS for diagnosis
  – Axonal and Demyelinating forms
• Antecedent illness or infection only 30%
• Other Variants: Miller Fisher variant w/ GQ1b Ab
Guillain Barre Syndrome: Key Points

• What will kill the patient
  – Respiratory Failure: Intubate for less than 20cc/kg
    • Frequent MIF/FVC
    • ICU or stepdown care always
  – DVT/PE: SQ heparin
  – Autonomic instability: cardiac (telemetry), ileus

• Treatment
  – IVIg or Pheresis, NOT steroids
  – The earlier the better

Case #3

• A 40 yo man comes to the ED with increasing weakness and dyspnea. The patient states that he has a history of myasthenia gravis diagnosed at an OSH two weeks ago but “things are going downhill.” He is on Mestinon (pyridostigmine) 60mg PO q4hrs and Prednisone 60mg PO qd. MIF is –10, FVC 250cc
Myasthenic Crisis

• True crisis vs. cholinergic crisis
• Triggers
  – Infection, surgery, initial steroids
• Management
  – Usually stop all anti-cholinesterase meds
  – Pheresis or IVIg
  – ICU, intubation, DVT/PE prophylaxis

Myasthenia Gravis: Key Points

• Two types of myasthenia
  – Young F>M
  – Old M=F
• Clinical: Bifacial weakness, Ptosis, fluctuations, proximal weakness, respiratory
• Diagnosis
  – Antibodies (~90% in generalized myasthenia)
  – EMG with repetitive stimulation, sfEMG
Myasthenia Gravis: Key Points

• Outpatient Management
  – Pyridostigmine (Mestinon)
  – Immunosuppression
    • Prednisone first then Imuran/CellCept/Cytoxan
  – What about the Thymus?

Case #4

• You are called to see a 76M with Parkinson’s disease on the orthopedic service who reports dramatic worsening of his disease following an elective hip replacement.
• On examination he has a soft voice and can barely move his limbs. He has a mild resting tremor of the LUE
Parkinson’s disease

- Idiopathic form caused by loss of cells in substantial nigra of brainstem
- Cardinal features
  - 1. Tremor
  - 2. Rigidity
  - 3. Bradykinesia
  - 4. Postural instability

<table>
<thead>
<tr>
<th>Speed</th>
<th>ET</th>
<th>PD</th>
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<tr>
<td></td>
<td>5-10Hz</td>
<td>4-6 Hz</td>
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<thead>
<tr>
<th>Symmetry</th>
<th>Symmetric</th>
<th>Asymmetric</th>
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<tr>
<td>Most Common Component</td>
<td>Postural</td>
<td>Rest</td>
</tr>
<tr>
<td>Helped by EtOH</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>FH?</td>
<td>Common Autosomal Dominant</td>
<td>Rare</td>
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Any sign of Parkinsonism in an ET pt should lead to questioning the diagnosis.
Admitted with Falls: What the Neurologist Finds

- 1. Parkinson’s disease
  - Exam: tremor, rigidity, postural instability
- 2. Neuropathy
  - Exam: numbness, decreased ankle reflexes
- 3. Cervical Myelopathy
  - Exam: spasticity, Lhermitte’s sign, increased ankle reflexes

Parkinson’s Treatment

1. Give L-Dopa
   - Levodopa/Carbidopa
2. Dopamine Receptor Agonists
   - Pramipexole, Ropinirole
3. Alter Dopamine/L-Dopa Metabolism
   - MAO-B Inhibitors: selegeline, rasagiline
   - COMT Inhibitors: entacapone
4. Decrease Cholinergic tone (rarely used)
5. Surgery: Deep Brain Stimulation (DBS)
Worsening of PD in House: Old Medication Issues

- All PD meds are (basically) oral
- Missing doses for some brittle patients can be incredibly problematic and lead to symptoms
- NPO arrangements are particularly challenging
- Need to write for exact times of medications (not bid/tid/etc)
- Ask if typically takes medications with food and try to accommodate

Worsening of PD in House: New Medication Issues

- Avoid all dopamine-depleting medications in these patients if possible
  - Antipsychotics
  - Many common antiemetics including prochlorperazine and metoclopramide
- Consider these medications as culprits in new-onset cases that arise in the hospital
  - Often more symmetric examination
Worsening of PD in House:
Concurrent Illness

- Not well described in the literature but commonly seen in practice
- Treating underlying illness key
  - Unlikely “rapid progression”
- May have to increase medications while sick
- Be particularly attentive to swallowing issues/aspiration risk and falls while worse
- Particularly susceptible to delirium as with all neurodegenerative disorders

Worsening of PD in House:
Wrong Diagnosis

- Drug-induced parkinsonism
- Vascular parkinsonism (not common)
- Parkinson’s plus syndromes
  - Progressive Supranuclear Palsy (PSP)
    - Vertical gaze problems
    - Frequent falls
  - Multiple Systems Atrophy (MSA)
    - Autonomic instability
    - Early ventilation problems and sleep-disordered breathing
Dementia with Lewy Bodies (DLB)

- Common Neurodegenerative disorder
- Parkinsonism
- Dementia
- Fluctuating Course
- Prominent Visual Hallucinations
- Extremely sensitive to antipsychotics
- Cholinergic Deficit:
  - TREATMENT WORKS!!!

Diagnosis of Multiple Sclerosis

- Lesions separated by time and space
- MRI clues
  - Involvement of corpus callosum
  - Some lesions with enhancement in acute period
- History of optic neuritis helpful
  - Visual Evoked Potentials (VEPs)
- Spinal Fluid
  - Oligoclonal bands, elevated IgG index
    - VERY non-specific for MS
Case #5

• A 32F with a known diagnosis of multiple sclerosis presents with a 1 week history of worsening LLE weakness
• She remains ambulatory but has tripped multiple times
• She let’s you know this is her “typical” flare and requests a 3 day admission for IV steroids

Is it really a flare of MS?

• Can be a very difficult question to sort out
• No good clinical clues
  – Always question, especially if similar to previous symptoms
• “Pseudoflare” in the setting of systemic illness including UTI, viral infection
• Gold standard is MRI with contrast
  – Enhancing lesions are active demyelination
Do we treat MS flares with steroids?

- What do steroids accomplish in MS?
  - No impact at all on eventual recovery at 6 mos
  - Speed up time to recovery
  - Make people feel really good
- Reserve for severely disabling flares only
  - Can’t ambulate
  - Bladder symptoms
  - Spinal cord

Admissions for IV steroids?

- Often necessary because being started in setting of inability to ambulate and can’t return to home environment
- Recent double-blind trial
  - 1000mg IV vs PO methylprednisolone
  - No difference found in safety or efficacy
  - Questions admitting those who are ambulatory
  - Caveat: a ton of oral pills

A revolution in MS treatment: Is this problem going away?

- B cell depleting therapy incredibly effective for reducing relapses
- When to use these powerful drugs unclear
  - Two schools of thought

Optic Neuritis

- Presents with unilateral visual loss, often including pain with eye movement
- Acutely funduscropy may be normal
- Differential broad
  - Central retinal artery occlusion
  - Anterior ischemic optic neuropathy including giant cell arteritis
  - Other ophtho emergencies

Optic Neuritis

- Usually a clinical diagnosis
  - MRI does show enhancement of the nerve but not typically used widely
- Treat with IV steroids x 3 days plus steroid taper based on old data
- MRI of brain typically obtained to gauge risk of developing MS
- Not all optic neuritis is MS
  - Infectious, autoimmune, neoplastic causes

Fulminant Demyelination

- Mass lesions or multifocal
- Often a trigger: infectious, vaccination, etc
- Difficult to diagnose
  - May need biopsy
- Difficult to treat
  - IV Steroids
  - Consideration of PLEX or IVIg
  - Aggressive chemotherapy
MS variant: Neuromyelitis Optica (NMO)

- Clues:
  - Optic neuritis (often bilateral) + spinal cord
- Diagnosis with AQP4 antibody
- Treatment
  - Steroids, PLEX acutely
  - B cell depleting therapy

Take home points

- ALS can be a difficult diagnosis to make: keep a high index of suspicion and consider EMG/NCS if considered
- Obtain MIF/FVC for all patients with 4 limb weakness or suspected neuromuscular disease
- GBS and myasthenic crisis can be life-threatening and death is usually respiratory
Take home points

• PD problems in the hospital are often medication-related
• PD, Neuropathy and cervical myelopathy cause falls in the elderly
• MS patients don’t always need steroids and when they do, outpatient administration is becoming more popular