Four Common Neurological Problems: 
An Update for 2009

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Disclosures

None
Objectives

• Learn an approach to the neurologic evaluation of a patient with a gait disorder and falls.

• Understand the initial workup and management of Parkinson Disease.

• Understand the initial workup and management of peripheral neuropathy.

• Review recent developments in the management of back pain.
Clinical Scenario

• A 67 year-old man comes to your office for routine yearly follow-up. You notice that his walking has gotten slower and he takes a lot more time in getting up from his chair in the waiting room. He is a stoic man and has never mentioned a problem with walking. When you ask him about it he says:

• “You know, maybe I have gotten a little slower. I always assumed that’s just what happens when you get older. Now that you mention it - I did lose my balance and fall the other day when I turned around to answer the phone. Why do you ask, doc?”
Gait Disorder and Falls

Most Common Causes of Falls in the Elderly

- Accident/Environment
- Gait and balance disorders and weakness
- Dizziness and vertigo
- Drop attacks
- Confusion
- Postural hypotension
- Visual disorder
- Syncope
- Other specified causes
- Unknown

Rubenstein and Josephson, Med Clin N Am 2006
Gait Disorder and Falls

Risk Factors for Falls

- Lower extremity weakness
- History of falls
- Gait deficit
- Balance deficit
- Use of assistive device
- Visual deficit
- Arthritis
- Impaired ADLs
- Depression
- Cognitive impairment

Rubenstein and Josephson, Med Clin N Am 2006
Gait Disorder and Falls

- Fall evaluation: “...an examination of basic neurological function, including mental status, muscle strength, lower extremity peripheral nerves, proprioception, reflexes, tests of cortical, extrapyramidal, and cerebellar function...”

Guideline for the Prevention of Falls in Older Persons, J Amer Ger Soc 2001
Gait Disorder and Falls

Most common neurological cause of falls in the elderly:

1. Peripheral neuropathy – 18%
2. Myelopathy – 17%
3. Stroke – 15%
4. Parkinson disease – 12%

Samuels and Feske eds, Office Practice of Neurology 2nd Edition, p 26
Gait Disorder: from top to bottom

- Cerebral Hemispheres (Stroke)
- Ventricular System (Hydrocephalus)
- Basal Ganglia (Parkinsonism)
- Cerebellum (Alcohol)
- Spinal Cord (Cervical Spinal Stenosis)
- Cauda Equina (Lumbar Spinal Stenosis)
- Peripheral Neuropathy (Diabetes, Alcohol)

Illustration from Wikipedia Commons, by William Crochot
Gait Disorder: from top to bottom

• High Yield Neurological Exam:
  – Talk to patient
  – Visual fields
  – Pyramidal weakness in 2 minutes:
    • Pronator drift (20 seconds)
    • Finger taps and foot taps (40 seconds)
    • Finger extensor and big toe strength (1 minute)
  – Check for spasticity and rigidity
  – Sensation: vibration sense and Romberg test
  – Reflexes: biceps, knee, and ankle
  – Coordination: finger-nose-finger, heel-knee-shin and tandem gait
  – Gait: tandem, toe and heel walking, Romberg and pull test
Scenario 1...

• He reports increased urinary frequency at night and urgency during the day, but no incontinence.

• On exam, he has full strength and normal tone in his arms, but his foot taps are slow and both EHLs are mildly weak. There is mild spasticity in his legs. Reflexes are brisk in the knees and ankles. Vibratory sensation is reduced to the knees.
Key Exam Features

- **Myelopathy:**
  - Talk to patient (*bowel/bladder dysfunction*)
  - Visual fields
  - **Pyramidal weakness** in 2 minutes:
    - Pronator drift (20 seconds)
    - Finger taps and foot taps (40 seconds)
    - Finger extensor and big toe strength (1 minute)
  - Check for *spasticity* and rigidity
- Sensation: *vibration sense and Romberg test*
- Reflexes: biceps, *knee, and ankle (increased)*
- Coordination: finger-nose-finger, heel-knee-shin and tandem gait
- Gait: tandem, toe and heel walking, Romberg and pull test
Cervical Stenosis
Myelopathy

• Common causes:
  – Structural
    • Cervical Stenosis
    • Tumors (bony metastases, foramen magnum tumors)
    • Infections (vertebral osteomyelitis/epidural abscess)
  – Medical
    • B12 deficiency
    • Multiple sclerosis
    • HIV myelopathy
    • Tabes dorsalis (syphilis)
    • Dural arteriovenous fistula
Scenario 2...

• By history, he reports his handwriting has gotten smaller.

• On exam, he has a left handed rest tremor, mild cogwheel rigidity on the left, breakdown of rapid alternating movements on the left, and a shuffling gait with an en-bloc turn.
Key Exam Features

• Parkinsonism:
  – Talk to patient *(hypophonia, masked facies, decreased blink rate, rest tremor)*
  – Visual fields
  – Pyramidal weakness in 2 minutes:
    • Pronator drift (20 seconds)
    • *Finger taps and foot taps – breakdown in amplitude*
    • Finger extensor and big toe strength (1 minute)
  – Check for spasticity and **rigidity**
  – Sensation: vibration sense and Romberg test
  – Reflexes: biceps, knee, and ankle
  – Coordination: finger-nose-finger, heel-knee-shin and tandem gait
  – **Gait: shuffling, en bloc turning, positive pull test**
Parkinson Disease

• What is the next step diagnostically?
  A. Brain MRI
  B. Head CT
  C. Cervical Spine MRI
  D. Trial of levodopa/carbidopa
  E. Trial of a dopamine agonist
  F. Referral to a neurologist
Parkinson Disease

• **Differential Diagnosis**
  – Secondary Parkinsonism:
    • Antipsychotics, anti-emetics
    • Vascular parkinsonism
    • Head trauma
    • Toxins (manganese)
    • Structural lesions (hydrocephalus, tumor, chronic subdural)
    • Metabolic (hypoparathyroidism, chronic liver disease)
  – Parkinson plus syndromes:
    • Dementia with Lewy bodies
    • Multiple system atrophy
    • Progressive supranuclear palsy
    • Corticobasal degeneration
Hydrocephalus
Presented in this patient purely as a gait disorder
PD: Treatment

- L-dopa vs. dopamine agonists:
  - Well known that the longer one is exposed to L-dopa, the higher the risk of motor complications (dyskinesias, wearing off, on-off fluctuations, freezing)
  - Often dopamine agonists are used first in order to delay the use of L-dopa
  - Whether this truly delays the onset of motor complications is debated
PD: Treatment

• CALM-PD 2009: long-term follow up of 301 patients from a trial of pramipexole vs. levodopa as initial management of early Parkinson Disease
  – Which is better at controlling motor symptoms?
  – Which is better at delaying motor complications?
  – Which has a better adverse effect profile?
## PD: Treatment

<table>
<thead>
<tr>
<th></th>
<th>Years of follow-up</th>
<th>Pramipexole</th>
<th>Levodopa</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UPDRS (mean change from baseline)</strong></td>
<td>2</td>
<td>-4.5</td>
<td>-9.2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>3.2</td>
<td>-2.0</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>2.4</td>
<td>0.5</td>
<td>0.11</td>
</tr>
<tr>
<td><strong>First dopaminergic motor complication</strong></td>
<td>2</td>
<td>28%</td>
<td>51%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>52%</td>
<td>74%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>50%</td>
<td>78%</td>
<td>0.002</td>
</tr>
<tr>
<td><strong>Quality of Life scores (mean change from baseline)</strong></td>
<td>2</td>
<td>1</td>
<td>-1</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>~4</td>
<td>~4</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>7.1</td>
<td>8.6</td>
<td>0.90</td>
</tr>
</tbody>
</table>

Parkinson Study Group, JAMA 2000, Arch Neurol 2004 and 2009
PD: Treatment

• Conclusions:
  – Either levodopa or a dopamine agonist can be used as initial treatment of PD
  – For patients with more disabling motor symptoms, levodopa is more effective
  – Using dopamine agonists first delays the onset of motor complications
  – Dopamine agonists:
    • Cause more somnolence
    • Cause more hallucinations (especially in the elderly)
    • Are associated with obsessive behaviors (pathologic gambling)
PD: Treatment

• Starting levo-dopa:
  – Combine with carbidopa to prevent conversion to dopamine outside of the CNS
  – Need at least 75 mg of carbidopa per day (e.g. Sinemet 25/100 TID)

• Choosing a dopamine agonist:
  – Use ropinerole or pramipexole; older ergot derived agonists such as pergolide can lead to cardiac valve fibrosis
Scenario 3...

• On further questioning, Mr. Gaites reports that his trouble walking is more severe at night. He also says his feet tingle almost constantly.

• On exam, he has diminished vibratory sensation to the knees and absent ankle jerks. Deciding to investigate further, you find he also has decreased pinprick sensation below the ankles.
• Peripheral Neuropathy:
  – Talk to patient
  – Visual fields
  – Pyramidal weakness in 2 minutes:
    • Pronator drift (20 seconds)
    • Finger taps and foot taps (40 seconds)
    • Finger extensor and big toe strength (1 minute)
  – Check for spasticity and rigidity
  – Sensation: vibration sense and Romberg test
  – Reflexes: biceps, knee, and ankle jerks
  – Coordination: finger-nose-finger, heel-knee-shin and tandem gait
  – Gait: tandem, toe and heel walking, Romberg and pull test
Peripheral Neuropathy

• Prevalence:
  – 2.4% of the population
  – 8% of people over age 55

• Etiology can be identified in 74-82% of cases

England et al, AAN Practice Parameter, Neurology 2009
Peripheral Neuropathy: Approach

Polyneuropathy
- HPI, Exam
  - Symmetric?
    - EMG NCS
      - Work up causes of mononeuropathy multiplex
  - Asymmetric?
### Mononeuropathy Multiplex

<table>
<thead>
<tr>
<th>Differential Diagnosis</th>
<th>Workup</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inflammatory</strong></td>
<td></td>
</tr>
<tr>
<td>Vasculitis</td>
<td>Aggressive vasculitis workup</td>
</tr>
<tr>
<td>Sarcoid</td>
<td>CXR, Chest CT, serum ACE</td>
</tr>
<tr>
<td>CIDP (Chronic Inflammatory Demyelinating Polyneuropathy)</td>
<td>EMG/NCS</td>
</tr>
<tr>
<td><strong>Infectious</strong></td>
<td></td>
</tr>
<tr>
<td>Leprosy</td>
<td></td>
</tr>
<tr>
<td>HIV (especially with CMV)</td>
<td>HIV Ab</td>
</tr>
<tr>
<td>Lyme</td>
<td>Lyme Ab</td>
</tr>
<tr>
<td><strong>Neoplastic</strong></td>
<td></td>
</tr>
<tr>
<td>Lymphoma</td>
<td>Directed workup</td>
</tr>
<tr>
<td>Waldenstrom’s Macroglobulinemia</td>
<td>SPEP/UPEP</td>
</tr>
<tr>
<td><strong>Compressive/Ischemic</strong></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>Fasting glucose, OGTT</td>
</tr>
<tr>
<td>Hypothyroidism</td>
<td>TSH, free T4</td>
</tr>
<tr>
<td>HNPP (Hereditary Neuropathy with susceptibility to Pressure Palsies)</td>
<td>Family history, Genetic testing</td>
</tr>
</tbody>
</table>
Peripheral Neuropathy: Approach

- HPI, Meds, FH, screening Labs
  - Symmetric?
    - Polyneuropathy
    - Asymmetric?
      - Work up causes of mononeuropathy multiplex
# Distal Symmetric Polyneuropathy

<table>
<thead>
<tr>
<th>Most Common and Treatable Causes of Symmetric Polyneuropathy</th>
<th>Workup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes (11%)</td>
<td>Fasting glucose, OGTT</td>
</tr>
<tr>
<td>Alcohol</td>
<td>History</td>
</tr>
<tr>
<td>B12 deficiency (3.6%)</td>
<td>B12, homocysteine, MMA, folate</td>
</tr>
<tr>
<td>Monoclonal Gammopathy (9%)</td>
<td>SPEP/UPEP</td>
</tr>
<tr>
<td>Uremia</td>
<td>Creatinine/BUN</td>
</tr>
<tr>
<td>Liver disease</td>
<td>Liver Function Tests</td>
</tr>
<tr>
<td>HIV</td>
<td>HIV Ab</td>
</tr>
<tr>
<td>Hypothyroidism</td>
<td>TSH, free T4</td>
</tr>
<tr>
<td>Vasculitis or connective tissue disease</td>
<td>ESR (OK as screening tool in symmetric polyneuropathy)</td>
</tr>
<tr>
<td>Toxin/drug exposure</td>
<td>Careful history</td>
</tr>
</tbody>
</table>

England et al, AAN Practice Parameter, Neurology 2009; Image from Wikipedia Commons
Neuropathy: Approach

HPI, Meds, FH, screening Labs

Polyneuropathy

Symmetric?

Asymmetric?

EMG NCS

Axonal?

Demyelinating?

Large Fiber?

Small Fiber?

Motor/ Sensory/ Autonomic Involvement?

Work up causes of mononeuropathy multiplex
How Does EMG Help?

Polyneuropathy

Symmetric?

Asymmetric?

EMG NCS

Axonal?

Demyelinating?

Large fiber?

Small fiber?

Work up causes of mononeuropathy multiplex
Distal Symmetric Polyneuropathy

- **Demyelinating**
  - CIDP
  - MMN (Multifocal Motor Neuropathy)
  - Paraproteinemic
  - Hereditary

  GM1 antibodies
  SPEP/UPEP, MAG antibodies
  Examine Family members

- **Large Fiber Axonal**
  - Causes listed in prior table
  - Vitamin deficiency (E, B1, B6)
  - Infectious (Hepatitis, Lyme)
  - Hereditary
  - Inflammatory: sarcoid, Sjogren’s, celiac disease

  Thorough medication, toxin, and dietary history
  Hepatitis serologies (B and C), cryoglobulins, Lyme Ab
  Examine Family members
  ANA, SSA, SSB

- **Small Fiber**
  - Diabetes
  - Alcohol
  - Amyloid
  - HIV

  Abdominal fat pad biopsy
Scenario 4...

• Your patient says his walking has been stiff ever since he “aggravated” his back lifting his two year-old grandson two months ago. The pain is mostly in his back, but sometimes shoots down his right leg.

• His neurologic examination is normal except an absent right ankle jerk and pain on straight leg raising on the right.

• He is worried about the pain and asks: “do you think I need an MRI, doc?”
Low Back Pain: When to Image

Radiculopathy: 90% of disk herniations occur at L4/L5 or L5/S1
Worrisome causes: Cancer, Infection, Osteoporosis, Ankylosing Spondylitis
Key Exam Features

• Low Back pain:
  – Talk to patient *(Sciatica? Bowel and bladder symptoms?)*
  – Visual fields
  – Pyramidal weakness in 2 minutes:
    • Pronator drift (20 seconds)
    • Finger taps and foot taps (40 seconds)
    • Finger extensor and **big toe strength** (1 minute)
  – Check for spasticity and rigidity
  – **Sensation:** vibration sense and Romberg test; *L4, L5, and S1 dermatomes*
  – **Reflexes:** biceps, **knee and ankle**
  – Coordination: finger-nose-finger, heel-knee-shin and tandem gait
  – Gait: tandem, toe and heel walking, Romberg and pull test
Low Back Pain: Imaging

• Chou et al, 2009: Meta-analysis of imaging strategies for low back pain
• Six trials comparing immediate imaging vs. usual care
• Patients:
  – Duration of pain ranged from < 3 weeks to < 12 months in most (one trial included patients with < 1 year of pain)
  – Excluded those with red flags or signs of cauda equina syndrome
  – 24-44% had symptoms of sensory radiculopathy
• Imaging modalities included plain films (4 studies) and MRI or CT (2 studies)
• Outcomes:
  – Follow up ranged from 3 weeks to 12 months*
  – No benefit in pain, function, quality of life, overall improvement

Chou et al, Lancet 2009
What have we learned from the SPORT trials?

- SPORT: Spine Patient Outcomes Research Trial
  - Lumbar Disk Herniation
  - Degenerative Spondylolisthesis
  - Lumbar Spinal Stenosis
Lumber Disk Herniation

• Patients:
  – Lumbar disk herniation by imaging
  – Persistent symptoms for 6 weeks
  – Radicular pain
  – Positive straight leg raising sign OR corresponding neurologic deficit
    • Dermatomal sensory loss, decreased reflex, or weakness

Weinstein et al, NEJM 2006
Lumbar Disk Herniation

Weinstein et al, NEJM 2006

1244 Enrolled

501 Randomized
- 245 assigned to surgery
  - 140 (60%) had surgery
- 256 assigned to non-operative
  - 107 (45%) had surgery

743 in Observational Cohort
- 521 chose surgery
  - 481 (96%) had surgery
- 222 chose non-operative
  - 48 (22%) had surgery
Lumbar Disk Herniation

• Adverse effects of surgery:
  – Reoperation in 9% at 2 years
  – No perioperative mortality

• Conclusions:
  – Most people get better
  – Surgery associated with less pain, less disability, sustained at 2 years
  – Diskectomy is a reasonable treatment option if:
    • Persistent radicular pain for >6 weeks
    • Positive straight leg raise or neurologic deficit
    • Usually surgery is performed earlier for bowel/bladder symptoms or progressive motor deficit

Weinstein et al, NEJM 2006
Lumbar Disk Herniation

- 4 year outcomes:
  - Similar to 2 year outcomes in favor of surgery group.
  - Good prognosis: about 80% working in each group
Spondylolisthesis

• Adverse effects of surgery:
  – Postoperative complications: 9%
  – Additional surgery within 2 years: 11%
    • Complication (8%), recurrence (3%)

• Conclusions:
  – Little harm from either approach
  – Little improvement in non-operative group
  – Less benefit than seen with disk herniation, but greater treatment effect compared to no surgery

Weinstein et al, NEJM 2007
Spinal Stenosis

• Adverse effects of surgery:
  – Postoperative complication: 8%
  – Reoperation within 2 years: 8%
    • Complication (4%)
    • Recurrence or progressive spondylolisthesis (3%)

• Conclusions:
  – Little harm from either approach
  – Little improvement in non-operative group
  – For persistent spinal stenosis lasting more than 12 weeks, surgery is a reasonable option

Weinstein et al, NEJM 2008
Low Back Pain: When to Image

- Nonspecific (85% of cases):
  - No imaging

- Radiculopathy or Spinal Stenosis:
  - Reassess in 1 month

- Progressive neurologic deficit or Cauda equina:
  - MRI

- Specific worrisome cause:
  - Appropriate imaging study

- MRI if persistent symptoms
References


