Assessing and managing gait disorders in the elderly

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Objectives

1. Evaluate musculoskeletal problems contributing to gait disorders and effects of treatment.
2. Manage patients with neurological causes of gait disorders.
3. Distinguish how treatment for patients with Parkinson’s Disease differs in the elderly.
Epidemiology

- 1 in 10 elderly have difficulty walking
- 20%-25% >80 yo use mechanical gait aid
- 2/3 hospitalized elderly >75 yo have decline in mobility; at discharge, 2/3 of those patients not improved & 1/10 worse

ICU-Acquired Weakness


- Both polyneuropathy and primary myopathy develop commonly in critically ill elderly, especially with sepsis
- More common in women (4:1); continuous passive range of motion, bicycle ergometer in respirator patients reduced muscle wasting
- Rehab “frustratingly slow”, especially elderly, functional recovery delayed up to five years or may never completely recover
Age-Related Gait Changes

• Normal gait: toe off, swing phase, heel strike; only 25% time supported on both feet
• In healthy elderly, abnormal gait more prevalent with advancing age
• Often multifactor (75%); when single cause, musculoskeletal is most common

Case 1

• A 75 yo with history of hypertension complains of pain in his forefoot exacerbated by exercise and relieved by rest.
• Dorsalis pedis pulse is palpable bilaterally. The patient has hammer deformities of his toes.
Case 1

• A. Send patient for vascular ultrasound of lower extremities
• B. Begin clopidogrel (Plavix) 75 mg
• C. Begin aspirin 325 mg
• D. Send patient to podiatrist

Hammer Toe Deformities Leading to Metatarsalgia?

Metatarsalgia!
Antalgic Gait

• Painful joint/muscle produces abnormal gait
• Hip, knee, and back pain are common causes of antalgic gait
• Foot pain: 30% of community elderly have foot problems interfering with mobility

Osteoarthritis, Analgesia, and Gait

• Placebo-controlled studies suggest NSAIDs improved stride length and velocity + pain relief
• Review of randomized trials suggests NSAIDs superior to placebo but little difference between agents
• Cane may be as effective as NSAIDs
Osteoarthritis, Exercise and Gait

- Exercise benefits pain > disability but gait does improve; as few as 8 sessions with PT has lasting effects > 1 yr (Deyle GD, Henderson NE, Matekel RL, et al. *Ann Intern Med*. 2000;132:173-181)

- Weight loss + exercise achievable and better than either alone in self-reported disability among elderly

Prevention of mobility disability

(Pahor et al, JAMA doi: 10:1001/jama2014.5616)

- LIFE study of 70-89 year old sedentary volunteers with physical limitations

- Intervention: moderate intensity physical activity program in a center twice weekly; home exercise 3-4 times/week (vs health education program)

- Modest reduction in risk of major motor disability
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Neurological Gait Disorders

- Peripheral neuropathy: distal sensory and motor signs only
- Lumbosacral: lesion below end of spinal cord (T12) = no upper motor neuron signs
- Cervical: upper motor signs: no cranial nerve or gray matter signs (eg, dementia)
- Brain: cr n and gray matter signs, EPS
Case 2

• 85 yo with advanced dementia seen in ER for 3 days of increasing weakness, inability to stand on own (had been walking with cane), less verbal, slightly more confused.

• Exam: clear speech, demented. Equal leg strength. Barely able to stand with wide base of support; can’t walk.

Case 2

• A. Check B12, folate, and TSH
• B. Order EMG of lower extremities
• C. Order CT of head
• E. Order MRI of thoracolumbosacral spine
Central Gait Disorder

- Slow, wide-based, shuffling, small-stepped, “magnetic,” difficulty turning
- When severe, truncal instability and can’t initiate a step; can’t stand without support; often few focal signs
- Most pts also have impaired cognition
- Differential Dx: “multi-infarct,” NPH, subdural hematoma

Case 2: Management

- CT or MRI if recent worsening or candidate for shunt (NPH) or subdural drainage
- Review and reduce medications
- Consider trial of physical therapy (caveat: poor sitting balance is poor prognostic sign)
Photo courtesy of Laurence Robbins, MD
Take-Home Point

• Central lesions of the CNS produce axial instability, often without focal neurologic signs

Case 3

• 3 months ago, 71 yo complained of increased falls and weak right knee. Chronic severe low back pain. Minimal neck discomfort. Referred to orthopedics.

• Mental status normal. Cranial nerves normal. Stiff-legged gait. Lower extremities show increased tone and hyperreflexia; bilateral lower ext weakness. Position sense impaired.
Case 3

• A. Order CT of head
• B. Order TSH, B12, blood sugar
• C. Order MRI of cervical spine
• D. Order MRI of lumbosacral spine

Case 3: Management

• Image neck (MRI) if candidate for surgery
• Check B12, TSH, glucose
Cervical Myelopathy

- Cervical myelopathy usually due to degenerative spine changes; may have little neck pain and no radicular symptoms
- Upper motor neuron signs often present
- Paresthesias and loss of position sensation may be caused by cervical myelopathy but may also have peripheral neuropathy
Upper Motor Neuron Signs

- Weakness (not complete paralysis) of a group of muscles, usually proximal (not a single muscle); minimal muscle atrophy
- “Clasp-knife” spasticity
- Hyperreflexia (+/- clonus)
- Babinski response
Surgery for Cervical Myelopathy

• Better response to surgery if shorter duration, less severe symptoms (better if not walker-dependent pre-op)

B12 Deficiency and Gait

• B12 deficiency associated with diminished proprioception and ataxia in adults; CBC may be normal
• Improvement within 2-3 mos of B12 Rx if any improvement at all
• Reversibility depends on severity and duration
Take-Home Points

• Spinal cord ends at T12; upper motor neuron signs suggest lesion above T12
• Reversibility of injury to nervous system depends on duration and severity of deficits, whether the cause is mechanical or metabolic

Case 4

• 74 yo man complains of exertional pain in back of thighs that limits walking; pain is worse walking downhill than uphill; some relief with rest and leaning forward; labs including alk phos & psa are normal
• On exam, normal cranial nerves, DTRs, and upper extremity strength; mild weakness of quadriceps bilaterally
Case 4

• A. Order CT of cervical spine
• B. Order CT of thoracic spine
• C. Order CT of lumbosacral spine
• D. Prescribe analgesic, order physical therapy

Lumbar Stenosis

• Pain greater than neurological findings
• Surgery may reduce pain/improve walking distance, but residual disability post-op is common
• Surgery may be postponed or avoided if walking disability mild (walking capacity improved in 42%, unchanged 32%, worse 26%)
Surgical Versus Nonsurgical Therapy for Lumbar Spinal Stenosis

(Weinstein JN, NEJM 2008; 358:794-810)

• 1/3 randomized to surgery didn’t get surgery; 2/5 “nonsurgical” group had surgery
• Benefit of surgery waned over time (2 years)
• “Often patients fear they will get worse without surgery, but the majority of patients in the nonsurgical group showed small improvements in all outcomes”

Case 5

• 82 yo retired professor brought by daughter complaining of increased difficulty walking. History of alcoholism, “no drink in years.” Takes chlordiazepoxide (Librium) for sleep.
• On exam, patient annoyed, refuses mental status test. Motor strength normal. Heel/shin, finger/nose WNL. Stance wide-based, eyes on feet. Small, shuffling steps when turning.
Case 5

• A. Order MRI of brain
• B. Order EMG
• C. Prescribe gabapentin 100 mg tid
• D. Stop chlordiazepoxide (Librium)

Cerebellar Disorders

• Most often, vascular or alcohol-related
• Truncal ataxia without limb dysmetria due to atrophy or infarction of vermis
• Individual muscle strength normal, tone normal; finger to nose, heel to shin often normal
• Benzodiazepines worsen gait; 28-fold increase in fall risk!
Alcohol and Gait Disorders

- Severity of gait disorder related to duration and quantity of alcohol consumption
- Peripheral neuropathy and cerebellar degeneration may occur independently or simultaneously
- Both gait and neuropathy may improve with abstinence

Other Causes of Gait Disorders

- Visual impairment increases risk for falls and fracture; greatest risk when depth perception impaired (i.e., one good eye, one bad eye; relative risk 2.0 to 6.0)
- Drugs worsen gait disorder (benzos, SSRIs, tricyclics, antipsychotics, anticonvulsants); list similar to those causing cognitive change
Take-Home Points: Gait Disorders

- Musculoskeletal causes common; think PT, exercise, analgesics, canes, foot care and orthotics, surgery
- Upper motor neuron signs = lesion above T12
- Central CNS lesions cause axial instability with few focal neurological signs
- Drugs, drugs, drugs

Case 6

- An 80 yo man is referred for evaluation of “depression; methylphenidate (Ritalin) candidate?”
- Meds: Hydrochlorthiazide, lisinopril, metoclopramide (Reglan)
- On exam, flat affect, immobile. Repeated attempts to stand unsuccessful. With help, stands and takes a few narrow-based, short steps, then freezes.
Case 6

• A. Prescribe methylphenidate
• B. Stop the lisinopril
• C. Prescribe carbidopa/levodopa (Sinemet)
• D. Stop metoclopramide (Reglan)

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Prevalence of Parkinsonism

- Accounts for 10% of gait disorders
- Community elderly >65; gait abn and 1 or more signs of parkinsonism:
  - 15% 65-74 yo
  - 30% 75-84 yo
  - 50% >85 yo

Clinical Features

- Tremor
- Rigidity
- Bradykinesia
- Gait disorder
- (Also, blunted postural reflexes and autonomic dysfunction)
Differential Diagnosis

- Idiopathic Parkinson’s disease  85%
- Drug-induced (eg, Reglan)  7%-9%
- Parkinson-plus syndromes  4%
- Vascular parkinsonism  3%
- Resting tremor, asymmetric rigidity & tremor and response to carbidopa/levodopa best predict correct diagnosis of PD

Treatment Principles

- Most medications reduce symptoms
- Very modest evidence that disease progression may be slowed
- Narrow therapeutic/toxic window
- Most effect achieved through dopamine
Medications for PD

- Anticholinergics (eg, trihexyphenidyl, benztropine)
- Amantadine (formerly Symmetrel)
- MAO inhibitor (selegiline [Eldepryl], rasagiline [Azilect])
- Carbidopa/L-dopa (Sinemet)
- Dopamine agonists (eg, bromocriptine [Parlodel], pramipexole [Mirapex], etc)
- COMT inhibitors (eg, entacapone [Comtan])

When to Start Drug Rx in the Elderly?

- Functional decline: dominant side more affected, interference with ADLs and gait

Why delay drug treatment?
- Medications often associated with side effects in elderly
- Cost of medication is high
Carbidopa/Levodopa (Sinemet)

• Most effective med for gait (bradykinesia, rigidity); tremor response variable
• Carbidopa prevents peripheral breakdown of levodopa; >75 mg daily for max effect
• Begin 25/100 bid or tid; may switch to 10/100 or 25/250 as dose increased; avg patient needs @ 500 to 1000 mg L-dopa/day
• Avoid taking with food

Sinemet CR

• Controlled release tablet has delayed onset and longer duration (25/100 or 50/200)
• May reduce dosing frequency by 1/3
• Only 80% absorbed (total dose higher); taken with food improves absorption
• Useful at bedtime for better overnight control
Anticholinergics

- Limited benefit for tremor, rigidity, and bradykinesia
- Common and disabling side effects (constipation, dry mouth, urinary retention, confusion, etc.)
- DON’T USE IN THE ELDERLY

Amantadine

- Modestly improves tremor, bradykinesia, and rigidity
- Mechanism of action uncertain
- Limited efficacy as disease progresses (100 to 200 mg daily)
- Toxicity includes confusion, psychosis
- May reduce L-dopa-induced dyskinesia
MAO B Inhibitors: Selegiline (Eldepryl)

• Monoamine oxidase Inhibitor (MAOI) inhibits breakdown of dopamine
• Minimal symptomatic benefit alone
• Early studies suggest delayed progress of PD (5 mg bid); benefit wanes quickly
• May smooth effect of carbidopa/L-dopa
• Risk of serotonin syndrome with SSRI

MAO B Inhibitors: Rasagiline (Azilect)

• FDA-approved May 2006
• Advantage over selegiline uncertain (may have slightly better efficacy when used alone)
• Dose 0.5 to 1 mg daily
• Expensive
Dopamine Agonists

- Dopamine agonists given alone may reduce PD signs
- Probably less effective than carbidopa/L-dopa (Sinemet)
- “Levodopa sparing;” delay dyskinesias
- May also improve response if combined with carbidopa/L-dopa
- Few comparisons between dopamine agonists; expensive

Dosing Dopamine Agonists

- **pramipexole** (Mirapex): begin .125 tid; goal is 4.5 mg/d in divided doses
- **ropinirole** (Requip): begin 0.25 tid; goal is 24 mg/d in divided doses
- Rotigotine (Neupro): begin 2mg/24 hr patch; titrate to 6mg/24 hr
COMT Inhibitors

- May smooth response to carbidopa/L-dopa (Sinemet)
- Entacapone (Comtan): 200 mg with each dose of carbidopa/L-dopa
- Reduce carbidopa/L-dopa 10%-15% to avoid levodopa toxicity (dyskinesia, etc)

Cost per 90 days

- Carbidopa/L-dopa 25/100 tid $260
- Carbidopa/L-dopa ER 50/200 bid $88
- Ropinirole 1 mg tid $160
- Pramipexole 0.5 mg tid $390
- Comtan (entacapone) 200 mg qid $1333
- Azilect (rasagiline) 1 mg daily $2255
- Neupro (rotigotine) 4mg patch $1620
Deep Brain Stimulation

• Can lead to functional improvement in pts with severe motor fluctuation
• No data in pts >75 yo (avg age in studies More postoperative complications in older subjects
• Does not prevent dementia, dysphagia, et al

Five Take-Home Points

• Carbidopa/L-dopa (Sinemet) is best; carbidopa >75 mg daily
• Avoid regular carbidopa/L-dopa with food
• Avoid anticholinergics, selegiline, amantadine
• Dopamine agonists may be added
• COMT inhibitors, new MAOI expensive
Key References


Thank you!
Case 7

• 75 yo complains that his hands shake when he tries to write or pick up a cup. This has been gradually progressive over the last 15 years. His father had a similar problem. On exam, he has a bilaterally symmetric tremor when his hands are outstretched in front of him.

Case 7

• A. Prescribe carbidopa/L-dopa (Sinemet)
• B. Prescribe propranolol
• C. Prescribe pramipexole (Mirapex)
• D. Prescribe atenolol
Differential Diagnosis of Tremor

<table>
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<tr>
<th>ESSENTIAL</th>
<th>PARKINSON</th>
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<tbody>
<tr>
<td>DISTRIB</td>
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</tr>
<tr>
<td>CHARACT</td>
<td>fine, intention, coarse, resting, familial, sporadic</td>
</tr>
<tr>
<td>RESPONSE</td>
<td>Beta blocker</td>
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Treatment of Tremor

- All tremors: reduce caffeine, stress, fatigue
- Essential tremor: propranolol 20-320 mg/d (not all beta blockers work); primidone (Mysoline) 25-500 mg/d; ? gabapentin (Neurontin)
- Orthostatic tremor: clonazepam 0.5-4 mg/d
- Cerebellar tremor: no effective treatment
Restless Legs Syndrome

• Marked disagreeable discomfort in the lower extremities that occurs only at rest and is immediately relieved by movement

• 20% of pts >80 yo; sleep disturbance freq

• Associations: depression, PD, iron deficiency, uremia, rheumatoid arthritis, polyneuropathy, B12 deficiency

Rx of Restless Legs Syndrome

• Avoid caffeine, tobacco, ethanol

• Check serum ferritin; if low, give 2-month trial of iron replacement

• Pramipexole 0.125 mg, Sinemet CR 50/200, clonazepam 0.5-1.0 mg, or oxycodone 5 to 10 mg hs effective in randomized, controlled trials