Ten Tips for Neurological Examination

The Portland Parkinson’s Program
Richard Rosenbaum, M.D.

Marcel Proust
Sodom and Gomorrah
p.45 (Penguin, Sturrock translation)

“The mistakes of doctors are innumerable. They err as a rule out of optimism as to treatment [false positive] and out of pessimism as to outcome [false negative].”
Ten Tips

- Always check gait.
- Take a good history.
- Coordination tests can tell more than strength tests.
- Do not obsess about the Babinski sign.
- Confrontation visual fields are better than no fields at all.
- Use techniques to bring out tremor.
- Distinguish rigidity from spasticity.
- Checking vestibular function is challenging.
- Distinguish types of dysarthria.
- Do not rely unduly on the sensory examination.

Fatal Gastroenteritis

- A 55 yo man presented to the ER with nausea and vomiting that began earlier in the day.
- PE BP 160/100 afebrile, normal abdominal and neurological exam while in bed.
- Discharged home with anti-emetics
- Found dead at home in bed the next day
10 Tips for Your Neurological Exam
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Fatal Gastroenteritis

- Dx: cerebellar hemorrhage
- Physical exam error- gait was not examined. It would have shown cerebellar ataxia, which can affect gait without causing appendicular ataxia, dysarthria, or abnormal eye movements

Neurologic Exam Website:
http://library.med.utah.edu/neurologicexam

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Gait examination

- Arise from chair, arms folded
- Walk normally – observe turns
- Walk on toes
- Walk on heels – observe arm swing
- Walk tandem, eyes open, eyes closed
- Check Romberg sign
Examples of Abnormal Gaits

- Hemiplegic
- Diplegic
- Neuropathic
- Myopathic
- Parkinsonian
- Choreiform
- Ataxic (cerebellar)
- Sensory

Stanford25.wordpress.com

Examples of Abnormal Gaits

- Antalgic gaits – the short contralateral step
  - Foot pain
  - Knee pain
  - Hip pain

McGee “Stance and Gait” in Evidence Based Physical Diagnosis

Verghece Cutting for Stone
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![Image of Gowers](image)

**Diagnostic Accuracy**
British Study of 100 patients

<table>
<thead>
<tr>
<th></th>
<th>Clinical Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PD</td>
</tr>
<tr>
<td>PD pathology</td>
<td>True Positive 76</td>
</tr>
<tr>
<td>No PD pathology</td>
<td>False Positive 24</td>
</tr>
</tbody>
</table>

Hughes et al Neurology 1992; 42:1142-1146
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**Parkinson’s Disease**

**Accuracy of Clinical Diagnosis**

- Correct diagnosis – 76
- Alzheimer’s – 6
- Other neurodegeneration – 13
- Strokes – 3
- Post-encephalitic – 1
- Essential tremor - 1

- Improve specificity to 93%
  - Asymmetric onset
  - No atypical features
  - No alternative diagnosis

Only 68% of the 76 met these criteria

---

**Diagnostic Accuracy**

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<tr>
<th>Clinical Diagnosis</th>
<th>PD</th>
<th>Not PD</th>
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<tbody>
<tr>
<td>PD pathology</td>
<td>True Positive 49</td>
<td>False Negative 27</td>
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<td>No PD pathology</td>
<td>False Positive 7</td>
<td>True Negative 17</td>
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Ten Tips

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- Checking vestibular function is challenging.
- Distinguish types of dysarthria.
- Do not rely unduly on the sensory examination.

Take a Good History

- Physical findings show anatomical localization.
- History shows the temporal course, which is crucial to neurological differential diagnosis.
- Some physical findings have temporal data:
  - Atrophy
  - Hypotrophy – small thumb nail in infantile hemiplegia
  - Distal hair loss, trophic changes in neuropathy
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Take a Good History

- Some diagnoses are based on history plus a normal exam
  - Seizures
  - Migraines
  - TIAs

- Some conditions have normal exam when mild; abnormal exam when severe
  - Carpal tunnel syndrome
  - Radiculopathy

Patients with unilateral brain lesions

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McGee Evidence Based Physical Diagnosis Box 57-1

### Coordination tests can tell more than strength tests.

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Teitelbaum CanJ NeuroSci 2002;29:337
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Attend to Patterns of Weakness

- For pyramidal lesions, arm extensor weakness precedes flexor weakness; hip abductor and ankle dorsiflexor weakness precede adductor and plantar flexor weakness
- DO NOT RELY ON GRIP STRENGTH

Coordination tests can tell more than strength tests.

- Pyramidal pattern
  - Arm pronator drift
  - Clumsy rapid movements
  - Arm flexors stronger than extensors
  - Leg extensors and hip adductors prevail
- Grips testing is insensitive

- Extrapyramidal pattern
  - Low amplitude rapid finger movements
  - Pauses
  - Incomplete extension at hand MP joints
“The mistakes of doctors are innumerable. They err as a rule out of optimism as to treatment [false positive] and out of pessimism as to outcome [false negative].”

From The Apocrypha of Dr. Robert Fishman:
“...I wish Babinski had been an architect.”

Do Not Obsess About the Babinski Sign

- Described by Babinski, 1896
- Noxious stimulation of lateral foot elicits toe dorsiflexion by extensor hallucis longus
- Polysynaptic reflex, indicative of pyramidal tract dysfunction
- Numerous variants: Chaddock, Gordon, Oppenheim, Gonda
- Can vary from exam to exam
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The Babinski sign and the pyramidal syndrome

- 50 patients with Babinski signs
  - 76% foot weakness, especially dorsiflexion
  - 14% proximal weakness only
  - 10% no weakness
  - 90% leg slowness (4% with nl strength)
- 6 patients with flexor plantar response, no weakness or clumsiness of leg, but with hyperreflexia or increased tone

### Table Interobserver reliability and validity of the Babinski sign and foot tapping

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>Neurologists</th>
<th>Non-neurologists</th>
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<td>Babinski testing</td>
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<td>No. of evaluations</td>
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<td>99</td>
<td>100</td>
</tr>
<tr>
<td>Kappa</td>
<td>0.30</td>
<td>0.28</td>
<td>0.36</td>
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<tr>
<td>Validity, %</td>
<td>56</td>
<td>58</td>
<td>54</td>
</tr>
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<td>Sensitivity, %</td>
<td>35</td>
<td>36</td>
<td>34</td>
</tr>
<tr>
<td>Specificity, %</td>
<td>77</td>
<td>80</td>
<td>74</td>
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<td>Foot tapping</td>
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<td>98</td>
<td>100</td>
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<tr>
<td>Kappa</td>
<td>0.73</td>
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<tr>
<td>Validity, %</td>
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<td>Sensitivity, %</td>
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<tr>
<td>Specificity, %</td>
<td>84</td>
<td>78</td>
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Confrontation Visual Fields Are Better than No Fields at All.
10 Tips for Your Neurological Exam  
Richard Rosenbaum M.D.

Patterns of Visual Field Defects  
http://www.brown.edu/Research/Memlab/py47/diagrams/visual-field-defects.jpg

Confrontation Visual Fields

- Face description
- Finger counting
- Finger comparison
- Red comparison
- Static finger wiggle
- Kinetic finger wiggle
- Kinetic red target – 5 mm pin head

Neurology. 2010 Apr 13;74(15):1184-90
## Confrontation Visual Fields

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<tr>
<td>Finger counting</td>
<td>25%</td>
<td>100%</td>
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<tr>
<td>Finger comparison</td>
<td>71%</td>
<td>57%</td>
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<tr>
<td>Red comparison</td>
<td>77%</td>
<td>27%</td>
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<tr>
<td>Static finger wiggle</td>
<td>44%</td>
<td>97%</td>
</tr>
<tr>
<td>Kinetic finger wiggle</td>
<td>39%</td>
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**Combine SFW/KRT**                | 78%         | 90%         |

Double Simultaneous Stimulation Detects Neglect

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</tr>
<tr>
<td>Hemianopia</td>
<td>30%</td>
<td>98%</td>
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McGee Evidence Based Physical Diagnosis Box 57-1

I woke up to find the message in my left hand. It had me trembling. It wasn’t a fax, telegram, memo, or the usual sort of missal bringing disturbing news. In fact, my hand held nothing at all. The trembling was the message.

Tremor: rhythmic, oscillatory

- Action - postural, kinetic
  - Essential
  - Physiological
    - Drug enhanced
  - Dystonic
  - Cerebellar
  - Rarer causes

- Rest
  - Parkinson’s disease
    - Accompanied by rigidity, bradykinesia, postural instability; usually asymmetric onset
  - Drug-induced
  - Essential
Physiological Tremor

- Very symmetric
- Milder, lower amplitude, faster than ET
- Onset 15-35, often anxious
- Cogwheeling without rigidity
- Affects voice but never head
- Enhanced by drugs

Prevalence of Movement Disorders after age 50

Austrian population: Lancet Neurology 2005; 4:815
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Richard Rosenbaum M.D.

Use techniques to bring out tremor.

- Tremor at rest
  - Increases with concentration or using other parts of body, decreases with movement, may reappear in new posture
- Tremor of position
  - Increase with elbows bent
  - Balance a sheet of paper on hand
  - Compare pronation, supination, and neutral
- Tremor with movement like finger-nose

Essential Tremor

- Starts wrist and proximal arm
- Flexion-extension, starts immediately
- Kinetic, postural, and intentional
- Can be mildly asymmetric
- Decreases with alcohol
- Absent in sleep
- Often familial
- More prevalent with aging (senile tremor)
- 4-12 Hz
- Cogwheeling but not rigidity, occ resting
- Slow progression, usually eventually spreads to head but rarely starts in head.
- (Think of dystonia for head-only tremors.)
### Essential Tremor

#### Body Parts Affected

<table>
<thead>
<tr>
<th>Body Part</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Trunk</td>
<td>5</td>
</tr>
<tr>
<td>Face</td>
<td>5</td>
</tr>
<tr>
<td>Tongue</td>
<td>7</td>
</tr>
<tr>
<td>Voice</td>
<td>12</td>
</tr>
<tr>
<td>Legs</td>
<td>20</td>
</tr>
<tr>
<td>Head</td>
<td>34</td>
</tr>
<tr>
<td>Arms</td>
<td>95</td>
</tr>
</tbody>
</table>

### Other features

- Unsteady tandem gait
- Mild cognitive impairment
- Personality: harm avoidant, fearful, pessimistic, shy
- Decreased sense of smell
- Hearing impairment
Drug-induced tremor

**Action**
- Caffeine
- Nicotine
- Sympathomimetics
- Thyroid
- Steroids
- SSRIs, tricyclics
- Amiodarone, procainamide
- Valproate
- Lithium

**Rest**
- Neuroleptics, atypical antipsychotics
- Metoclopramide, other antiemetics
- Lithium, valproate
- Phenytoin
- Alpha methyl dopa
- Calcium channel blockers

Dystonic Tremor

- Often focal – neck tremor, writing tremor
- Less regular than essential tremor
- Sensitive to position of the tremulous part
- Often improves with botulinum toxin
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**DYSTONIC TREMOR PRESENTING AS PARKINSONISM: LONG-TERM FOLLOW-UP OF SWEDDs**

- 59 year old man, right >> left tremor
- Decreased arm swing
- Increased arm tone with reinforcement
- Slow repetitive right finger movement

**SWEDDs**
Scans Without Evidence of Dopamine Deficits

**18F DOPA PET SCANS**

Normal (SWEDD)  Parkinson’s

NEJM 2001; 344:710-719
**SWEDDs**

**Scans Without Evidence of Dopamine Deficits**

**18F DOPA PET SCANS**

- Normal (SWEDD)
- Parkinson’s

4 -15% of patients with clinical diagnosis of Parkinson’s may have SWEDDs

**DYSTONIC TREMOR PRESENTING AS PARKINSONISM: LONG-TERM FOLLOW-UP OF SWEDDs**

- 59 year old man, right >> left tremor
- Decreased arm swing
- Increased arm tone with reinforcement
- Slow repetitive right finger movement
- No response to L-DOPA
- Minimally progressive

*Bain, P. G. Neurology 2009;72:1443-1445*
Action tremor
Less common causes

- Cerebellar
- Wilson’s disease
- FXTAS = fragile X tremor ataxia syndrome
- Orthostatic tremor
- Rubral
- Psychogenic

- Decreases with Distraction
- Changes Frequency with Entrainment
Distinguish Rigidity from Spasticity

- Spasticity
  - Elicit with quick movements
    - e.g. supine patient, examiner lifts knee slowly v. quickly
  - Sign of upper motor neuron lesion
  - Correlates imperfectly with hyperreflexia

- Rigidity
  - Lead pipe
  - Paratonia
    - Gegenhalten
    - Mitgehen
  - Gegenhalten
  - Mitgehen
  - Can increase with reinforcement

Distinguish Rigidity from Spasticity

- Rigidity in Early Parkinson’s Disease
  - Sensitivity 30%
  - Specificity 43%


- Rigidity
  - Lead pipe
  - Paratonia
    - Gegenhalten
    - Mitgehen
  - Can increase with reinforcement
Checking vestibular function is challenging

- Vestibular disease is one of many causes of dizziness
- Patients have trouble describing dizziness
- A healthy brain suppresses nystagmus during fixation
- CNS disease rarely causes vertigo in isolation

Check vestibular function with past pointing and Fukuda tests.

- Finger-nose with eyes open tests cerebellum
- Past pointing with eyes closed tests inner ear and joint position sense
- Fukuda test (walk 50 steps in place eyes closed) tests inner ear
Fukuda

The Stepping Test

Acta Otolaryngol 1959; 50:95-108

- March in place, 50 steps with eyes closed
- Normal: < 30 degrees rotation, < 50 cm forward
- Abnormal in unilateral vestibular disease
- Risk of false positives

Fukuda Stepping Test: Sensitivity and Specificity

- 738 patients with vestibular disease
- Criterion standard for vestibular dysfunction: 25% asymmetry of slow velocity on calorics
- Fukuda Stepping Test
  - Sensitivity 0.5
  - Specificity 0.61

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Barany Past Pointing Test
- Touch examiner’s finger, close eyes, raise hand overhead, then return to finger
- Normal hits the finger
- Abnormal points to the hypoactive ear
- Cold calorics make ear hypoactive with nystagmus fast phase away; therefore, finger points to the slow phase of nystagmus
- Less reliable in compensated or bilateral disease

Head Impulse Test
- Tests vestibular function
- Pt watches examiner’s nose
- Quickly rotate 20 degrees
- Normal keeps fixation
- Abnormal has catch-up saccade

Jorns-Haederli et al Accuracy of the bedside head impulse test in detecting vestibular hypofunction JNPP 78;2007: 1113

Compared to scleral search coils

- 33ad -
Distinguish Types of Dysarthria.

- Cerebellar – ‘Around the rugged rock’
- Bulbar
  - Lingual – ‘La, la’
  - Pharyngeal – ‘Pa, pa, ga, ga’
- Facial – ‘Mi, mi’
- Laryngeal – ‘Ee, ee’
- Pseudobulbar – spastic
- Microphonic
- Hyperkinetic

Do not rely unduly on the sensory examination

- Modalities
  - Touch
  - Pain & Temperature
  - Vibration
  - Position sense
  - Cortical
    - Stereognosis
    - Graphesthesia
    - Double simultaneous

- Patterns
  - Peripheral neuropathy
  - Mononeuropathy
  - Radiculopathy
  - Spinal cord
  - Brain stem
  - Thalamus
  - Cortical

McGee “Examination of the Sensory System” in Evidence Based Physical Diagnosis
Diagnosis of Diabetic Peripheral Neuropathy by Signs and Symptoms

- 24 diabetics, one half with neuropathy
- Examined by 12 prominent neurologists
  - Median performance
    - 16/24 correct (range 13 - 22)
    - 3/24 under diagnoses (range 1-8)
    - 5/24 over diagnoses (range 0-9)
- We can argue about the gold standard, but a group clinical standard compared well to nerve conduction results.
  

Barriers to Sensory Exam

- Physiological sensory experiences are common
- Paresthesias are often due to excessive nerve irritability
- Sensory self observation is hard
- Anatomy varies
- Callosities interfere
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Brachialgia nocturna paresthaestica
De Krom et al, 1992

- Door-to-door random Dutch survey
- Awakening at night with unpleasant sensations in fingers at least weekly
- Positive history in 15% of women and 8% of men
- An additional 4% of women had known CTS
- Positive NCV for CTS in 5.8% of women, 0.6% of men

Sensory Territories

- Radial = shaded
- Ulnar = little and medial ring finger
- Median = palmar thumb; index, middle, and lateral ring finger palmar surface and dorsal tips
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Theory

Real

Digit

Paresthesia in Cervical Radiculopathy
Frykholm Acta Chir Scand 1951 Suppl 160:1

Leg Paresthesia

- 42 yo healthy woman
- 3 weeks of leg paresthesia, ascending to knees
- Exam: normal leg tone and strength, gait, tendon reflexes, plantar responses
- Normal pin, joint position, and vibration sense
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