A Hypothesis Driven Approach to the Neurological Exam

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Disclosures

None
Purpose of Neuro Exam

• Screen asymptomatic patients
• Screen patients with symptoms that could indicate a focal neurologic lesion (e.g. back pain, headache, seizure)
• Localize the lesion in patients with neurologic deficits
  – Generate a differential diagnosis
  – Decide what test to get next (e.g. brain MRI, spine MRI, EMG/NCS, CK)

Typical “Screening” Neuro Exam

• Mental Status: Level of alertness, orientation, attention, language, memory
• Cranial Nerves: II through XII
• Motor: Bulk, tone, power in all muscles in both arms and legs
• Sensory: Light touch, vibration/joint position sense, pain/temperature, Romberg
• Reflexes: Biceps, triceps, brachioradialis, knees, ankles, plantar response
• Coordination: Finger-nose-finger, heel-knee-shin
• Gait: Observe gait, include tandem, heel, and toe walking
High Yield Screening Neuro Exam

- Mental Status: language, orientation, and attention
- Cranial Nerves: visual fields, eye movements, and facial symmetry
- Motor: Pronator drift, finger and foot taps, finger extensor and extensor hallucis longus power
- Sensory: Romberg
- Coordination: Finger-nose-finger and heel-knee-shin (can replace HKS with gait)
- Reflexes: Biceps, knees, and ankles
- Gait: Observe gait (base, stride, posture, arm swing, turn), tandem

Case Scenarios

**HYPOTHESIS-DRIVEN NEURO EXAM**
Patient #1

• A 23 y/o woman with a history of migraine headaches is admitted to the hospital with left leg cellulitis. On hospital day 2, she complains of a new headache. She says it’s different from her previous migraines because it is “much worse” and is wondering if she needs an MRI.

Headache

Suspected localization
• Focal brain lesion

Other potential presenting symptoms
• Seizure
• Unilateral weakness
• Unilateral numbness
• Dysarthria
Patient #2

- A 74 y/o former ballet dancer is found by the police wandering in the street. He is brought to the ED where he is agitated and confused with rambling incoherent speech.
Altered Mental Status

Suspected localization

• Focal brain lesion
• Diffuse metabolic process

Hypothesis-Driven Neuro Exam
Patient #2 Exam

• Awake, alert
• Rambling, fluent but incomprehensible speech
• No commands
• Absent blink to threat on right

Inferior Division MCA Stroke
Patient #3

- 57 y/o man with afib transferred to UCSF for management of status epilepticus. He presented to another hospital comatose with bilateral jerking movements of the arms and legs.

Coma

Suspected localization
- Bilateral hemispheres
- Brainstem
Hypothesis-Driven Neuro Exam

Patient #3 Exam

- No eye opening to pain
- R pupil 6 mm, unreactive, L pupil 4 -> 2 mm
- Absent R corneal reflex
- Absent VOR to the R
- No withdrawal to pain on the left
A 32 y/o woman presents with tingling in the hands and feet that progressed to diffuse weakness in the arms and legs over four days. She is now so weak she can no longer sit up.
**Diffuse Weakness**

**Suspected localization**
- High spinal cord
- Neuropathy
- Neuromuscular junction
- Myopathy

**Other potential presenting symptoms**
- Diplopia
- Dysarthria
- Dysphagia
- Respiratory failure

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**Localization of Weakness**

<table>
<thead>
<tr>
<th>Localization of Weakness</th>
<th>Pattern of weakness</th>
<th>Tone</th>
<th>Bulk</th>
<th>Reflexes</th>
<th>Sensory Loss</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Motor Neuron</td>
<td>Pyramidal</td>
<td>Spastic</td>
<td>Normal</td>
<td>Increased</td>
<td>Varies</td>
<td></td>
</tr>
<tr>
<td>Anterior Horn Cell</td>
<td>Pyramidal or myotomal</td>
<td>Spastic or normal</td>
<td>Atrophy</td>
<td>Increased or decreased</td>
<td>None</td>
<td>Fasciculations</td>
</tr>
<tr>
<td>Peripheral Nerve</td>
<td>In distribution of root or nerve</td>
<td>Normal or reduced</td>
<td>Atrophy</td>
<td>Decreased</td>
<td>Prominent</td>
<td></td>
</tr>
<tr>
<td>Neuromuscular Junction</td>
<td>Diffuse</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal (myasthenia) or Absent (botulism)</td>
<td>None</td>
<td>Posis and ophthalmo -paresis</td>
</tr>
<tr>
<td>Muscle</td>
<td>Proximal &gt; Distal</td>
<td>Normal</td>
<td>Normal or patterned atrophy</td>
<td>Normal</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
Patient #4: Exam

• Diffuse weakness throughout both arms and legs in both flexors and extensors
• No sensory level
• Decreased pinprick sensation in the feet
• Diffusely absent reflexes

Guillain-Barre Syndrome
Patient #5

- A 53 y/o man with HIV and a history of laryngeal cancer presents with back pain and urinary urgency.

Back Pain

**Suspected localization**
- Spinal cord

**Other potential presenting symptoms**
- Urinary or bowel incontinence
- Bilateral leg weakness or numbness
Patient #5: Exam

- Decreased EHL power bilaterally
- Spasticity in both legs
- Sensory level to pinprick at T5
Epidural Abscess
Summary

• High yield screening exam
• Hypothesis driven approach to:
  – Suspected focal brain lesion
  – Altered mental status and coma
  – Diffuse weakness
  – Suspected spinal cord lesion

Acknowledgements

• Hooman Kamel
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• Images from Wikimedia Commons
Bonus Case

• A 30 y/o woman with lupus, APLAS, and history of endocarditis on gentamycin presents with acute vertigo.

Vertigo

**Suspected localization**
- Brainstem
- Cerebellum
- Inner ear

**Other potential presenting symptoms**
- Imbalance
Patient #4: Exam

- Left beating nystagmus in left-gaze only
- Positive head thrust test to the right
Gentamycin Toxicity