THE 3 MINUTE NEUROLOGICAL EXAMINATION DEMYSTIFIED
Faculty:
W.J. Oczkowski MD, FRCPC
Professor and Academic Head, Division of Neurology, Department of Medicine, McMaster University
Stroke Neurologist, Hamilton Health Sciences

Relationships with commercial interests:
► Not Applicable

Potential for conflict(s) of interest:
► Not Applicable
Mitigating Potential Bias

► All the recommendations involving clinical medicine are based on evidence that is accepted within the profession.
► All scientific research referred to, reported, or used is in the support or justification of patient care.
► Recommendations conform to the generally accepted standards.
► Independent content validation.
► The presentation will mitigate potential bias by ensuring that data and recommendations are presented in a fair and balanced way.
► Potential bias will be mitigated by presenting a full range of products that can be used in this therapeutic area.
► Information of the history, development, funding, and the sponsoring organizations of the disclosure presented will be discussed.
Objectives

Overview of neurological assessment
- It’s all about stroke!
- It’s all about the chief complaint and history.

Overview:
- 3 types of clinical exams
- Neurological signs
- Neurological localization
  - Pathognomonic signs
  - Upper versus lower motor neuron signs

Cases and practice
Bill

72 year old male
- Hypertension
- Smoker

Stroke call: dizzy, facial droop, slurred speech

Neurological Exam:
- Ptosis and miosis on left
- Numb left face
- Left palatal weakness
- Dysarthria
- Ataxic left arm and left leg
- Numb right arm and leg
# NIH Stroke Scale

<table>
<thead>
<tr>
<th>Feature</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOC: a,b,c</td>
<td>0</td>
</tr>
<tr>
<td>Best gaze</td>
<td>0</td>
</tr>
<tr>
<td>Visual fields</td>
<td>0</td>
</tr>
<tr>
<td>Facial palsy</td>
<td>0</td>
</tr>
<tr>
<td>Motor arm and leg</td>
<td>0</td>
</tr>
<tr>
<td>Limb ataxia</td>
<td>2</td>
</tr>
<tr>
<td>Sensory</td>
<td>1</td>
</tr>
<tr>
<td>Best Language</td>
<td>0</td>
</tr>
<tr>
<td>Dysarthria</td>
<td>1</td>
</tr>
<tr>
<td>Extinction and inattention</td>
<td>0</td>
</tr>
</tbody>
</table>

- (tone, reflexes, distal sensation, gait)

- Left Ptosis
- Left miosis
- Weakness of left palate
It’s all about Stroke!

Focal Motor or Sensory Presentation

Stroke
Not Stroke
EKG of Stroke
Troponin of Stroke
How do doctors make diagnoses?

<table>
<thead>
<tr>
<th></th>
<th>contribution</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chief complaint</td>
<td>78%</td>
<td>78%</td>
</tr>
<tr>
<td>History</td>
<td>16%</td>
<td>94%</td>
</tr>
<tr>
<td>Physical exam</td>
<td>4%</td>
<td>98%</td>
</tr>
<tr>
<td>Lab studies</td>
<td>2%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Detection of focal cerebral hemisphere lesions using the neurological examination

N E Anderson, D F Mason, J N Fink, P S Bergin, A J Charleston, G D Gamble

Objective: To determine the sensitivity and specificity of clinical tests for detecting focal lesions in a prospective clinical study.

Methods: 48 patients with a focal cerebral hemisphere lesion without obvious focal signs and 19 controls with normal imaging were examined using a battery of clinical tests. Examinations were blinded to the diagnosis. The sensitivity, specificity, and positive and negative predictive values of each test were measured.

Results: The upper limb tests with the greatest sensitivities for detecting a focal lesion were finger tapping (sensitivity 0.89, confidence intervals 0.75 to 0.97), assessment of power (0.67 to 0.69), rapid alternating movements (0.30 to 0.49), sensory testing (0.24 to 0.38), and pronator drift (0.22 to 0.32). All of these tests had a specificity of 0.80 to 1.00. This combination of tests allowed an abnormality in 30% of the patients with a focal lesion. The lower limb, assessment of power was the most sensitive test (sensitivity 0.33 to 0.41) and visual field defects in 10 patients with a focal lesion (sensitivity 0.22 to 0.35) and visual field defects in 20 patients with a focal lesion.

Conclusions: The neurological examination has a low sensitivity for detecting early cerebral hemisphere lesions in patients without obvious focal signs. The finger and lower extremity tests, rapid alternating movements of the hands, and pronator drift were simple tests that increased the detection of a focal lesion without greatly increasing the length of the examination.

METHODS

Patients

Focal lesion group

Forty-six patients (26 men and 18 women) aged 21 to 85 years (mean 51) had a single cerebral hemisphere lesion identified on computed tomography (CT) (23 patients), or on both CT and magnetoencephalogram (MEG) (22 patients). One patient had MRI only. Their clinical and radiological features are presented in Table 1. Seventeen patients had presented with focal neurological symptoms: parietal epilepsy (5), hemiparesis (4), transient ischemic attacks (2), hemisensory symptoms (1), and hemisomatoid hemiparesis (1). Twenty-eight patients had non-focal symptoms: headache (4), epilepsy without focal features (9), change in cognitive function (1), light-headedness (1), blurred vision (1), and vertigo (1). One patient did not have neurological symptoms. Focal signs had been detected before recruitment in 14 patients (30%). Multiple upper motor neurone signs (9), homonymous hemianopia (5), hemisensory signs (4), and speech (4).

Control group

Forty-nine patients who had been referred for investigation of headaches (15) or transient neurological events (epilepsy, transient ischemic attacks, syncope, psychogenic pseudobulbar palsy, vertigo, headaches, and an unexplained transient neurological event in one patient each) but had normal imaging formed the control group. One control patient had MRI only, the others were investigated with CT, MRI or both. MRI was the only test that the patient presenting with a transient ischemic attack had focal neurological symptoms. None had focal signs before recruitment in the study.

Sample size

The sample size was determined by estimating the weight of the 95% confidence intervals (CI) around a theoretical sensitivity, specificity, positive predictive value, and negative predictive value of 90%. A sample size of 100 was conservatively estimated to provide precision of the 95% CI to within 5%. It was recognized that fewer cases would be required if the discriminatory power of a test was either very good or very poor, so provision was made for an interim examination to determine the final sample size. At least 10 cases were required to determine the precision of the sensitivity and specificity of the various tests to within 5%.
The upper limb tests with the greatest sensitivities for detecting a focal brain lesion:

- Finger rolling
- Forearm rolling
- Assessment of power
- Rapid alternating movements
- Pronator drift
  - Detect 50%; specificity of 100%
“The” 3 Minute Neurological Exam

- LOC: a,b,c_____________________
- Best gaze_____________________
- Visual fields___________________
- Facial palsy___________________
- Motor arm and leg_______________
- Limb ataxia___________________
- Sensory_______________________
- Best Language_________________
- Dysarthria___________________
- Extinction and inattention_____
  - (tone, reflexes, distal sensation, gait)
A Neurological Examination

- Assess orientation (“How old are you? What month is it?”)
- Assess the ability to describe the picture
- Assess the ability to read the sentences
- Assess visual fields and assess for inattention (4 quadrants)
- **Assess the pupillary light reflex**
- Assess eye movements following the “H” pattern
- Assess facial sensation (left and right cheek using sharp and dull)
- Assess facial movements (close eyes, smile)
- **Assess hearing using finger rub**
- Assess palatal and tongue movements (say “ah”, stick out tongue)
- **Assess tone in the 4 limbs**
- Assess strength using drift and arm rolling tests
- Assess distal sharp-dull and vibration sensation and sensory inattention
- **Assess reflexes (biceps, brachioradialis, triceps, quadriceps, achilles, Babinski)**
- Assess limb coordination (finger to nose, heel – knee – shin)
- **Assess gait and tandem walking (tandem gait, normal gait)**
A Neurological Examination

- Assess orientation (“How old are you? What month is it?”)
- Assess the ability to describe the picture
- Assess the ability to read the sentences and name the objects
- Assess visual fields and assess for inattention (4 quadrants)
- **Assess the pupillary light reflex**
- Assess eye movements following the “H” pattern
- Assess facial sensation (left and right cheek using sharp and dull)
- Assess facial movements (close eyes, smile)
- **Assess hearing using finger rub**
- Assess palatal and tongue movements (say “ah”, stick out tongue)
- **Assess tone in the 4 limbs**
- Assess strength using drift and arm rolling tests
- Assess distal sharp-dull and **vibration sensation** and sensory inattention
- **Assess reflexes (biceps, brachioradialis, triceps, quadriceps, achilles, Babinski)**
- Assess limb coordination (finger to nose, heel – knee – shin)
- **Assess gait and tandem walking (tandem gait, normal gait)**
You know how.

Down to earth.

I got home from work.

Near the table in the dining room.

They heard him speak on the radio last night.
A Neurological Examination

- Assess orientation (“How old are you? What month is it?”)
- Assess the ability to describe the picture
- Assess the ability to read the sentences
- Assess visual fields and assess for inattention (4 quadrants)
- **Assess the pupillary light reflex**
- Assess eye movements **following the “H” pattern**
- Assess facial sensation (left and right cheek using sharp and dull)
- Assess facial movements (close eyes, smile)
- **Assess hearing using finger rub**
- Assess palatal and tongue movements (**say “ah”, stick out tongue**)  
- **Assess tone in the 4 limbs**
- Assess strength using drift and arm rolling tests
- Assess distal sharp-dull and **vibration sensation** and sensory inattention
- **Assess reflexes (biceps, brachioradialis, triceps, quadriceps, achilles, Babinski)**
- Assess limb coordination (finger to nose, heel – knee – shin)
- **Assess gait and tandem walking (tandem gait, normal gait)**
“THE EXAM”

- Diagnostic
  - localization
- Screening or “Once Over” Examination
- Measuring and monitoring
A “Screening” / “Once Over” 
Neurological Examination

► Pre-test probability of abnormality is low
► “May” identify non-obvious abnormalities
► Is not a diagnostic exam
A Screening or “Once Over” Neurological Examination

- LOC: a,b,c_____________________
- Best gaze_____________________
- Visual fields___________________
- Facial palsy____________________
- Motor arm and leg_______________
- Limb ataxia____________________
- Sensory________________________
- Best Language__________________
- Dysarthria_____________________
- Extinction and inattention_____
  - (tone, reflexes, distal sensation, gait)
A Measuring and Monitoring Neurological Examination

§ Most useful when an abnormality is present and etiology known

§ Useful is assessing change

§ NIH Stroke Scale

§ Canadian Neurological Scale
A Measuring and Monitoring Neurological Examination

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOC: a,b,c</td>
<td></td>
</tr>
<tr>
<td>Best gaze</td>
<td></td>
</tr>
<tr>
<td>Visual fields</td>
<td></td>
</tr>
<tr>
<td>Facial palsy</td>
<td></td>
</tr>
<tr>
<td>Motor arm and leg</td>
<td></td>
</tr>
<tr>
<td>Limb ataxia</td>
<td></td>
</tr>
<tr>
<td>Sensory</td>
<td></td>
</tr>
<tr>
<td>Best Language</td>
<td></td>
</tr>
<tr>
<td>Dysarthria</td>
<td></td>
</tr>
<tr>
<td>Extinction and inattention</td>
<td></td>
</tr>
<tr>
<td>(tone, reflexes, distal sensation, gait)</td>
<td></td>
</tr>
</tbody>
</table>
Examination that I do all the time.....

- The neurological examination has many pieces
- Everyone has been taught a different examination
- We need to speak the same language
NIH Stroke Scale Training – You Should Do This!

Professional Resources

NIH Stroke Scale Training - Online or Mobile
Emergency physicians, neurologists, hospitals and nurses can take the National Institutes of Health stroke scale testing and earn continuing education credit.

Get With The Guidelines® Stroke
Get With The Guidelines®Stroke helps ensure continuous quality of improvement of acute stroke treatment and ischemic stroke prevention. It focuses on care team protocols to ensure that patients are treated and discharged appropriately.

Target: Stroke
Target Stroke was created to help hospital teams seize the opportunity to improve stroke outcomes by achieving door-to-needle (CTNI) times of 60 minutes or less.

Research
Find out how to apply for ASA research training and project support.

Stroke Statements and Guidelines
Also find clinical updates, commentaries and more at the Stroke Learning Library on My American Heart for Professionals.

Stroke Resource Center
Patient education resources and marketing tools you can download and customize (qualified hospitals) to help spread stroke awareness.

Management of Stroke in Infants and Children
In its first scientific statement on stroke in infants and children the American Heart Association/American Stroke Association addresses treatments, symptoms and risk.

Join the Stroke Council
The mission of the Stroke Council is to foster excellence in stroke research and education and to achieve the objectives of the American Stroke Association in research, treatment and prevention.
A Diagnostic Neurological Examination

- Identifies the neuro-anatomical diagnosis
  - “Where is the lesion?”
- May help identify a possible non-stroke etiology
  - “What is the lesion?”
Top - Down
Left - Right
Patient - Examiner
Hemispheres
Brainstem
Spinal Cord
Nerves
Muscles
Neuromuscular Junction
The Diagnostic Neurological Exam

- LOC: a, b, c_________________
- Best gaze_________________
- Visual fields________________
- Facial palsy_________________
- Motor arm and leg_____________
- Limb ataxia_________________
- Sensory_________________
- Best Language_________________
- Dysarthria_________________
- Extinction and inattention____
  - (tone, reflexes, distal sensation, gait)
Assess orientation ("How old are you?, What month is it?")
Assess the ability to describe the picture.
Assess the ability to read the sentences

You know how.

Down to earth.

I got home from work.

Near the table in the dining room.

They heard him speak on the radio last night.
Assess visual fields and assess for inattention (4 quadrants)
Assess the pupillary light reflex
Assess eye movements following the “H” pattern
Assess facial sensation (left and right cheek using sharp and dull)
Assess facial movements (close eyes, smile)
Assess palatal and tongue movements (say “ah”, stick out tongue)
Assess tone in the 4 limbs
Assess strength using drift and arm rolling tests
Assess distal sharp-dull and vibration sensation and sensory inattention
Assess reflexes (biceps, brachioradialis, triceps, quadriceps, Achilles and Babinski)
Assess limb coordination (finger to nose, heel – knee – shin)
Assess gait and tandem walking (tandem gait, normal gait)
The Diagnostic Neurological Exam

► LOC: a,b,c_________________
► Best gaze__________________
► Visual fields________________
► Facial palsy________________
► Motor arm and leg__________
► Limb ataxia________________
► Sensory___________________
► Best Language______________
► Dysarthria_________________
► Extinction and inattention____
  ▪ (tone, reflexes, distal sensation, gait)
The Nervous System is Distributed

Weakness is a Poor Localizer
Upper versus Lower Motor Neuron

**Upper**
- Weakness
- Tone increased
- Hyper-reflexia
- Minimal wasting
- Babinski

**Lower**
- Weakness
- Tone normal
- Hypo-reflexia
- Fasiculations and wasting
- No Babinski
Neuro - Anatomical Localization

- Brain
- Brainstem
- Spinal cord
- Peripheral nerve
- Muscle
- Neuromuscular junction

*Upper Motor Neuron*

*Lower Motor Neuron*
Neuro - Anatomical Localization For Stroke……

- Brain
- Brainstem
- Other
- Spinal cord
- Peripheral nerve
- Muscle
- Neuromuscular junction
Examination of the Patient with Focal Weakness

- Brain vs brainstem vs spine vs nerve vs muscle vs neuromuscular junction
- Pattern of weakness and other signs
- Are there pathognomonic signs?
- Is it upper or lower motor neuron?
  - Tone, reflexes
Roger

- 57 year old male
  - Atrial fibrillation
  - CAD, CHF
  - Pacemaker
  - DM2
  - HTN, DL

- Presented with sudden left sided weakness
### NIH Stroke Scale +

<table>
<thead>
<tr>
<th>Item</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOC: a,b,c</td>
<td>0</td>
</tr>
<tr>
<td>Best gaze</td>
<td>1</td>
</tr>
<tr>
<td>Visual fields</td>
<td>2</td>
</tr>
<tr>
<td>Facial palsy</td>
<td>2</td>
</tr>
<tr>
<td>Motor arm and leg</td>
<td>8</td>
</tr>
<tr>
<td>Limb ataxia</td>
<td>0</td>
</tr>
<tr>
<td>Sensory</td>
<td>2</td>
</tr>
<tr>
<td>Best Language</td>
<td>0</td>
</tr>
<tr>
<td>Dysarthria</td>
<td>0</td>
</tr>
<tr>
<td>Extinction and inattention</td>
<td>2</td>
</tr>
</tbody>
</table>

- (tone, reflexes, distal sensation, ...
Where is the Lesion?

1. Brain
2. Brainstem
3. Other
   1. Spinal cord
   2. Peripheral nerve
   3. Muscle
   4. Neuromuscular junction
Pathognomonic Signs

- Hemispheric
  - Aphasia
  - Neglect / agnosia / apraxia
  - Visual field loss
  - Behaviour
  - Memory
  - LOC, attention
Maria

► 66 year old female

- HTN
- DL
- Depression

► Found at home on the floor unable to talk and with right sided weakness
NIH Stroke Scale +

- LOC: a,b,c
- Best gaze
- Visual fields
- Facial palsy
- Motor arm and leg
- Limb ataxia
- Sensory
- Best Language
- Dysarthria
- Extinction and inattention
- (tone, reflexes, distal sensation, gait)

<table>
<thead>
<tr>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>
Where is the Lesion?

1. Brain
2. Brainstem
3. Other
   1. Spinal cord
   2. Peripheral nerve
   3. Muscle
   4. Neuromuscular junction
Pathognomonic Signs

- Hemispheric
  - Aphasia
  - Neglect / agnosia / apraxia
  - Visual field loss
  - Behaviour
  - Memory
  - LOC, attention
Gladys

- 85 year old female
  - Hypertension
  - Dyslipidemia

- Found on the floor with a decreased LOC
- Slurred speech, vomiting, and right arm weakness
NIH Stroke Scale +

- LOC: a,b,c_________________
- Best gaze_________________
- Visual fields________________
- Facial palsy________________
- Motor arm and leg___________
- Limb ataxia________________
- Sensory____________________
- Best Language_______________
- Dysarthria_________________
- Extinction and inattention____
- (tone, reflexes, distal sensation, gait)

Score

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>2</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>-</th>
</tr>
</thead>
</table>
Where is the Lesion?

1. Brain
2. Brainstem
3. Other
   1. Spinal cord
   2. Peripheral nerve
   3. Muscle
   4. Neuromuscular junction
Pathognomonic Signs

Brainstem

- Cranial Nerve Abnormality with...
  - Limb motor sign
  - Limb sensory sign
- Crossed motor signs
- Crossed sensory signs
- Limb ataxia
Virginia

- 91 year old female
  - Atrial flutter
  - CHADS = 1
- Medications: ASA

- Presented with sudden onset of inability to speak
### NIH Stroke Scale +

<table>
<thead>
<tr>
<th>Item</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOC: a,b,c</td>
<td>1</td>
</tr>
<tr>
<td>Best gaze</td>
<td>0</td>
</tr>
<tr>
<td>Visual fields</td>
<td>0</td>
</tr>
<tr>
<td>Facial palsy</td>
<td>2</td>
</tr>
<tr>
<td>Motor arm and leg</td>
<td>0</td>
</tr>
<tr>
<td>Limb ataxia</td>
<td>0</td>
</tr>
<tr>
<td>Sensory</td>
<td>0</td>
</tr>
<tr>
<td>Best Language</td>
<td>2</td>
</tr>
<tr>
<td>Dysarthria</td>
<td>0</td>
</tr>
<tr>
<td>Extinction and inattention</td>
<td>0</td>
</tr>
<tr>
<td>(tone, reflexes, distal sensation, gait)</td>
<td></td>
</tr>
</tbody>
</table>
Where is the Lesion?

1. Brain
2. Brainstem
3. Other
   1. Spinal cord
   2. Peripheral nerve
   3. Muscle
   4. Neuromuscular junction
Pathognomonic Signs

- Hemispheric
  - Aphasia
  - Neglect / agnosia / apraxia
  - Visual field loss
  - Behaviour
  - Memory
  - LOC, attention
Diana

- 74 year old woman
  - Poorly controlled DM
  - Hypertension
  - Dyslipidemia
- Facial droop,
- Acute MI, primary PCI
- Rapidly resolving right weakness and inability to understand
## NIH Stroke Scale +

- **LOC:** a,b,c 3
- **Best gaze:** 0
- **Visual fields:** 0
- **Facial palsy:** 1
- **Motor arm and leg:** 0
- **Limb ataxia:** 0
- **Sensory:** 1
- **Best Language:** 2
- **Dysarthria:** 0
- **Extinction and inattention:** 0

*(tone, reflexes, distal sensation, gait)*
Where is the Lesion?

1. Brain
2. Brainstem
3. Other
   1. Spinal cord
   2. Peripheral nerve
   3. Muscle
   4. Neuromuscular junction
Pathognomonic Signs

► Hemispheric
  ▪ Aphasia
  ▪ Neglect / agnosia / apraxia
  ▪ Visual field loss
  ▪ Behaviour
  ▪ Memory
  ▪ LOC, attention
Wayne

- 68 year old male
  - Atrial fibrillation
  - Previous TIA
  - Hypertension

- Hiking with his wife
- Dizziness, loss of balance, double vision, left weakness
NIH Stroke Scale +

- LOC: a,b,c_____________________
- Best gaze_____________________
- Visual fields___________________
- Facial palsy____________________
- Motor arm and leg_______________
- Limb ataxia_____________________
- Sensory________________________
- Best Language__________________
- Dysarthria_____________________
- Extinction and inattention_____
- (tone, reflexes, distal sensation, gait)

<table>
<thead>
<tr>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>-</td>
</tr>
</tbody>
</table>
Where is the Lesion?

1. Brain
2. Brainstem
3. Other
   1. Spinal cord
   2. Peripheral nerve
   3. Muscle
   4. Neuromuscular junction
Pathognomonic Signs

Brainstem

- Cranial Nerve Abnormality with:
  - Limb motor sign
  - Limb sensory sign
- Crossed motor signs
- Crossed sensory signs
- Limb ataxia
Livia

► 70 year old female

- Hypertension
- Dyslipidemia
- Anxiety and depression

► Coronary angiography

► Post angiogram headache

► “unable to see”
NIH Stroke Scale +

- LOC: a, b, c_________________
- Best gaze___________________
- Visual fields________________
- Facial palsy________________
- Motor arm and leg___________
- Limb ataxia________________
- Sensory____________________
- Best Language_______________
- Dysarthria_________________
- Extinction and inattention____
- (tone, reflexes, distal sensation, gait)

<table>
<thead>
<tr>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>-</td>
</tr>
</tbody>
</table>
Where is the Lesion?

1. Brain
2. Brainstem
3. Other
   1. Spinal cord
   2. Peripheral nerve
   3. Muscle
   4. Neuromuscular junction
Pathognomonic Signs

- Hemispheric
  - Aphasia
  - Neglect / agnosia / apraxia
  - Visual field loss
  - Behaviour
  - Memory
  - LOC, attention
Christinia

- 82 year old female
  - Hypertension
  - Diabetes
  - Dyslipidemia
- Collapse with sudden right leg weakness
NIH Stroke Scale +

- LOC: a,b,c_________________
- Best gaze_________________
- Visual fields________________
- Facial palsy________________
- Motor arm and leg__________
- Limb ataxia________________
- Sensory___________________
- Best Language______________
- Dysarthria________________
- Extinction and inattention____
  (tone, reflexes, distal sensation, gait)

Score

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
</tbody>
</table>
Where is the Lesion?

1. Brain
2. Brainstem
3. Other
   1. Spinal cord
   2. Peripheral nerve
   3. Muscle
   4. Neuromuscular junction
Pathognomonic Signs

- Hemispheric
  - Aphasia
  - Neglect / agnosia / apraxia
  - Visual field loss
  - Behaviour
  - Memory
  - LOC, attention
Pathognomonic Signs

Brainstem

- Cranial Nerve Abnormality with....
  - Limb motor sign
  - Limb sensory sign
- Crossed motor signs
- Crossed sensory signs
- Limb ataxia
June

- 88 year old female
  - CAD
  - Aortic stenosis
- Acute MI
- Triple vessel bypass
- Aortic valve replacement
- Awoke confused and with left arm weakness
NIH Stroke Scale +

- LOC: a,b,c_________________
- Best gaze____________________
- Visual fields__________________
- Facial palsy___________________
- Motor arm and leg____________
- Limb ataxia___________________
- Sensory_______________________
- Best Language________________
- Dysarthria____________________
- Extinction and inattention_____
- (tone, reflexes, distal sensation, gait)

<table>
<thead>
<tr>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>-</td>
</tr>
</tbody>
</table>
Where is the Lesion?

1. Brain
2. Brainstem
3. Other
   1. Spinal cord
   2. Peripheral nerve
   3. Muscle
   4. Neuromuscular junction
Pathognomonic Signs

- Hemispheric
  - Aphasia
  - Neglect / agnosia / apraxia
  - Visual field loss
- Behaviour
- Memory
- LOC, attention
Greg

- 31 year old male
  - Well
- Collapsed
- Brought to ER with left weakness
NIH Stroke Scale +

- LOC: a,b,c_____________________
- Best gaze_____________________
- Visual fields___________________
- Facial palsy___________________
- Motor arm and leg______________
- Limb ataxia___________________
- Sensory_______________________
- Best Language_________________
- Dysarthria___________________
- Extinction and inattention____
  (tone, reflexes, distal sensation, gait)

Score

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>-</td>
</tr>
</tbody>
</table>
Where is the Lesion?

1. Brain
2. Brainstem
3. Other
   1. Spinal cord
   2. Peripheral nerve
   3. Muscle
   4. Neuromuscular junction
Pathognomonic Signs

Brainstem

- Cranial Nerve Abnormality with:
  - Limb motor sign
  - Limb sensory sign
- Crossed motor signs
- Crossed sensory signs
- Limb ataxia
Harry

- 65 year old male
  - Smoker
  - COPD
- Difficulty walking
- Difficulty breathing
- Admitted to stepdown and then ward
- Unable to urinate and ambulate
NIH Stroke Scale +

- LOC: a,b,c _______________________
- Best gaze _______________________
- Visual fields _______________________
- Facial palsy _______________________
- Motor arm and leg ________________
- Limb ataxia _______________________
- Sensory __________________________
- Best Language _______________________
- Dysarthria _________________________
- Extinction and inattention _______
- (tone, reflexes, distal sensation, gait)

Score

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LOC</td>
<td>0</td>
</tr>
<tr>
<td>Best gaze</td>
<td>0</td>
</tr>
<tr>
<td>Visual fields</td>
<td>0</td>
</tr>
<tr>
<td>Facial palsy</td>
<td>0</td>
</tr>
<tr>
<td>Motor arm and leg</td>
<td>6</td>
</tr>
<tr>
<td>Limb ataxia</td>
<td>0</td>
</tr>
<tr>
<td>Sensory</td>
<td>1</td>
</tr>
<tr>
<td>Best Language</td>
<td>0</td>
</tr>
<tr>
<td>Dysarthria</td>
<td>0</td>
</tr>
<tr>
<td>Extinction and inattention</td>
<td>0</td>
</tr>
<tr>
<td>(tone, reflexes, distal sensation, gait)</td>
<td>-</td>
</tr>
</tbody>
</table>
Where is the Lesion?

1. Brain
2. Brainstem
3. Other
   1. Spinal cord
   2. Peripheral nerve
   3. Muscle
   4. Neuromuscular junction
Pathognomonic Signs

- Spinal cord
  - Nothing above the neck
  - Bladder and Bowel trouble
  - Bilateral leg
  - **Spinal sensory level**
Transverse section of the spinal cord showing the main ascending and descending tracts.
Linda

- 63 female
  - Previous stroke with “complete” recovery
  - Atrial fibrillation
  - Diabetes type 2

- Presented with severe dysarthria, and left weakness
**NIH Stroke Scale +**

- LOC: a,b,c ___________________
- Best gaze __________________
- Visual fields __________________
- Facial palsy __________________
- Motor arm and leg ___________
- Limb ataxia __________________
- Sensory ____________________
- Best Language _______________
- Dysarthria ___________________
- Extinction and inattention ___ (tone, reflexes, distal sensation, gait)

<table>
<thead>
<tr>
<th>Score</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>6</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>2</th>
<th>0</th>
</tr>
</thead>
</table>

Tongue weak
Where is the Lesion?

1. Brain
2. Brainstem
3. Other
   1. Spinal cord
   2. Peripheral nerve
   3. Muscle
   4. Neuromuscular junction
Pathognomonic Signs

Brainstem

- Cranial Nerve Abnormality with....
  - Limb motor sign
  - Limb sensory sign
- Crossed motor signs
- Crossed sensory signs
- Limb ataxia
Shelly

- 32 year old female
  - Healthy
- Difficulty walking up stairs
- Tingling in her feet
- Minor bladder symptoms
NIH Stroke Scale +

- LOC: a,b,c_________________
- Best gaze__________________
- Visual fields________________
- Facial palsy________________
- Motor arm and leg___________
- Limb ataxia________________
- Sensory____________________
- Best Language_______________
- Dysarthria__________________
- Extinction and inattention____
- (tone, reflexes, distal sensation, gait)

Score
0
0
0
2
4
0
0
0
1
0
-
Where is the Lesion?

1. Brain
2. Brainstem
3. Other
   1. Spinal cord
   2. Peripheral nerve
   3. Muscle
   4. Neuromuscular junction
Pathognomonic Signs

► Absent Reflex (es)
  ▪ Lower motor neuron
  ▪ Nerve
Bill

- 72 year old male
  - Hypertension
  - Smoker
- Stroke call: dizzy, facial droop, slurred speech
- Neurological Exam:
  - Ptosis and miosis on left
  - Numb left face
  - Left palatal weakness
  - Dysarthria
  - Ataxic left arm and left leg
  - Numb right arm and leg
NIH Stroke Scale +

- LOC: a,b,c_________________
- Best gaze__________________
- Visual fields________________
- Facial palsy________________
- Motor arm and leg__________
- Limb ataxia________________
- Sensory____________________
- Best Language______________
- Dysarthria__________________
- Extinction and inattention____
- (tone, reflexes, distal sensation, gait)

Score

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Left Ptosis
- Left miosis
- Weakness of left palate
Where is the Lesion?

1. Brain
2. Brainstem
3. Other
   1. Spinal cord
   2. Peripheral nerve
   3. Muscle
   4. Neuromuscular junction
Pathognomonic Signs

Brainstem

- Cranial Nerve Abnormality with:
  - Limb motor sign
  - Limb sensory sign
- Crossed motor signs
- Crossed sensory signs
- Limb ataxia
Pathognomonic Signs

- Nerve
  - In distribution of...
  - Lower motor neuron – absent reflexes
  - Pain
  - Wasting
  - Fasciculation
Pathognomonic Signs

Muscle
- Normal sensation
- Normal reflexes
- Wasting
- Proximal symmetric weakness
Pathognomonic Signs

- Neuromuscular Junction
  - Fatiguability
  - Normal sensation
  - Normal reflexes
A “Once Over” Examination
Measuring and Monitoring Examination
Diagnostic Examination

- LOC: a,b,c_________________
- Best gaze__________________
- Visual fields________________
- Facial palsy________________
- Motor arm and leg____________
- Limb ataxia________________
- Sensory____________________
- Best Language_______________
- Dysarthria__________________
- Extinction and inattention___
- (tone, reflexes, distal sensation, gait)
TAKE HOME MESSAGE

Ask “Why am I doing this examination?”

1. Is the pre-test probability of an abnormality low and a “once over” examination is needed?

2. Do I need to measure an impairment and a measuring and monitoring examination is needed?

3. Do I need to localize the lesion and a diagnostic examination is needed?
The 3 Minute Neurological Examination Demystified