67th Annual McGill Refresher Course
Hands On: The Tailored Neurological Exam
Disclosures

- None
Objectives

- Review the neurological exam
- Demonstrate technique where applicable
  - How to do it
- What is ‘evidenced based’?
  - Should we really be doing this?
- Understand organization and ways to ‘enhance’ organization (‘focus’ the exam)
  - How to do what we should be doing, effectively
<table>
<thead>
<tr>
<th></th>
<th>McGill neurologists</th>
<th>Canadian neurologists</th>
<th>McGill medical students</th>
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<td>Light touch</td>
<td>Vibration</td>
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<td>*Pinprick</td>
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<tr>
<td>Romberg</td>
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Goals for the practitioner

- To detect signs that, if otherwise missed, could adversely affect the patient’s condition
  - ER, office and ward setting
- Feel more comfortable with assessment
  - To get more from the consultation requested
- To develop an exam that is comprehensive, flexible, and efficient
What to look for

- Asymmetries
  - More than just physiological?
  - Co-localizing signs lend credence to findings
- ‘Systems affected’
  - Cortex
  - Corticospinal tract/ Somatosensory
  - Basal ganglia
  - Cerebellar
  - Peripheral nerve
General organization

- Mental status exam/dysphasia
- Cranial Nerves
- Motor Exam
- Sensory
- Reflexes
Mental Status

- Much information about language and cognition gained in initial conversation
- Dysphasia and dysarthria
- Folstein Mini-Mental and MoCA can both be done (www.moca.org)
- ‘Frontal lobe tests’ such as sequencing and no/no-go tests often forgotten
‘Upper’ Cranial nerves

- **CN 1**: often skipped, most commonly injured cranial nerves
  - Test with non-noxious substances (no perfume, contains alcohol)
- **CN 2**
  - Acuity, Visual Field, Pupils, Fundi
- **CN 3, 4, 6**
  - Conjugance, pursuits, saccades
Motor Function
- Masseter - most precisely examined
- Temporalis
- Medial/lateral Pterygoids
Cranial Nerve V - Sensory

- Sensory - Three divisions
  - Ophthalmic
  - Maxillary
  - Mandibular
- “Central Organization”
  - Most rostral part of nucleus is central
    - ‘onion peel’
‘Middle’ Cranial Nerves

- **CN 7**
  - Motor
  - Special sensory - taste - anterior 2/3 of tongue

- **CN 8**
  - Whispered voice
  - Weber, Rinne
‘Lower’ Cranial Nerves

- CN 9, 10
  - Voice quality
  - Gag reflex, palatal movement
  - Disregard uvula and watch the midline of soft palate
‘Lower’ Cranial Nerves

- **CN XI (The spinal accessory nerve)**
  - Sternocleidomastoid
  - Trapezius

- **CN XII (Hypoglossal)**
  - Unilateral lesions result in paresis, atrophy, furrowing
  - Deviation to side of paresis
Motor Exam

- Inspection-assymetries (atrophy) fasiculation
- Tone (spasticity/ rigidity/ paratonia)
- Power (MRC scale)
  - 0 no movement
  - 1 flicker of movement
  - 2 movement with gravity removed
  - 3 movement against gravity
  - 4 (4-, 4, 4+) movement against gravity
  - 5 normal power
Motor Continued

- Fine Motor Movements (Corticospinal)
  - Finger tapping, arm rotation
- ‘Cerebellar testing’
  - Rapid alternating movements
  - Finger-nose, heel-shin
  - Gait and station
‘Screening techniques’

- Used to screen for central nervous system abnormalities
- Used in patients who do not report focal weakness
- Question—are they as sensitive as a segmental exam?
A number to choose from....

- Pronator drift
- Barre
- Forearm roll/finger roll
- Mingazzini’s manoeuvre
- Fine motor movements
Sensory

- Principles
  - Relies on alert, cooperative patient
  - Brevity and simplicity
  - Abnormal to normal
  - Reproducibility
Use enough force to cause fingers to 'slide down' the pin
Other Techniques

- Vibration - offer maximal stimulus (hit it hard enough that the tuning fork makes a noise)
- Joint position - isolate the joint
- Temperature - understand that extremities are 4-6 degrees cooler than central body
Primary modalities
- Light touch, JPS, vibration
- Pin prick, temperature

Secondary
- Graphesthesia, stereognosis
- Primary modalities must be intact to make any assessment of secondary modalities
Deep tendon-grading

0: Absent
1: Hypoactive, present with reinforcement
2: Readily elicited with normal response
3: Brisk, without spread
4: Associated with clonus, tone change
### Reflexes / Spinal Roots

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Spinal Roots</th>
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<tbody>
<tr>
<td>Jaw jerk</td>
<td>CN 5</td>
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<tr>
<td>Biceps</td>
<td>C5-6</td>
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<tr>
<td>Brachioradialis</td>
<td>C6</td>
</tr>
<tr>
<td>Triceps</td>
<td>C7</td>
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<tr>
<td>Patellar</td>
<td>L2-4</td>
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<tr>
<td>Hamstrings</td>
<td>L5, S1</td>
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<td>Achilles</td>
<td>S1</td>
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Superficial reflexes

- Diminished with Upper or Lower Motor neuron lesions
- Superficial cutaneous
  - Abdominal (T8-T12)
  - Cremasteric (L2)
What do we base our exam on?

- Good evidence
- What we have been shown, history
- The rise of the exam
  - Early 1800s (Parkinson’s)
  - Charcot
  - World War 1
What do we base our exam on?

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Detection of local cerebral hemisphere lesions using the neurological exam

- Anderson NE et al JNNP 2005;76:545-549
- 46 patients with a focal imaging abnormality and without obvious focal signs (presented with non-focal symptoms)
- Compared with 19 controls
# Patient Characteristics

<table>
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<tr>
<th>Variable</th>
<th>N (%)</th>
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<tr>
<td>right</td>
<td>22(48)</td>
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<tr>
<td>left</td>
<td>24(52)</td>
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<tr>
<td><strong>Location</strong></td>
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<td>Intra-axial</td>
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<td>Extra-axial</td>
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<tr>
<td><strong>Affected lobe</strong></td>
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<td>Frontal</td>
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<td>Occipital</td>
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<td><strong>Diagnosis</strong></td>
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<td>Tumour</td>
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<td>Infarct</td>
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<td>AVM</td>
<td>3(7 )</td>
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## Upper limb-motor

<table>
<thead>
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<th>specificity</th>
<th>PPV</th>
<th>NPV</th>
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<tbody>
<tr>
<td>Finger roll</td>
<td>0.33</td>
<td>1.00</td>
<td>1.00</td>
<td>0.38</td>
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<td>UMN weakness</td>
<td>0.30</td>
<td>1.00</td>
<td>1.00</td>
<td>0.37</td>
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<tr>
<td>RAM</td>
<td>0.30</td>
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<td>Forearm rolling</td>
<td>0.24</td>
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<tr>
<td>Pronator drift</td>
<td>0.22</td>
<td>1.00</td>
<td>1.00</td>
<td>0.35</td>
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<tr>
<td>arm swing</td>
<td>0.22</td>
<td>0.89</td>
<td>0.83</td>
<td>0.32</td>
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<tr>
<td>Fist opening</td>
<td>0.15</td>
<td>1.00</td>
<td>1.00</td>
<td>0.33</td>
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<tr>
<td>Finger tapping</td>
<td>0.15</td>
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<td>1.00</td>
<td>0.33</td>
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<tr>
<td>Hyper-reflexia</td>
<td>0.11</td>
<td>0.95</td>
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<td>Unilateral grasp</td>
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# Lower limb signs

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<td>UMN weakness</td>
<td>0.20</td>
<td>1.00</td>
<td>1.00</td>
<td>0.34</td>
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<td>One foot balance</td>
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<td>Babinski</td>
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<tr>
<td>Foot tapping</td>
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<td>0.89</td>
<td>0.71</td>
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<tr>
<td>Spasticity</td>
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## Sensory Exam

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<td>Graphesthesia</td>
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<td>Extinction</td>
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<td>Finger-nose</td>
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<td>Pinprick</td>
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<td>Light touch</td>
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## Cranial Nerves

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<tr>
<td>OKN</td>
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Tests of Motor Function in Patients suspected of having mild unilateral cerebral lesions

  - Various test of 170 patients, with (86) and without (84) cerebral pathology
Tests of motor function

- Pronator drift
- Barre
- Arm roll/finger roll
- Reflexes
- Mingazzini’s manoeuvre
- Fine motor movements
## Higher sensitivities

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<tr>
<td>Pronator drift</td>
<td>0.92*</td>
<td>0.90</td>
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<td>Mingazzini</td>
<td>0.55</td>
<td>0.90</td>
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<tr>
<td>Barre</td>
<td>0.86</td>
<td>0.91</td>
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<tr>
<td>Fine finger movements</td>
<td>0.73</td>
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<td>reflexes</td>
<td>0.68</td>
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Most Common Consults

- Diplopia
- Headaches
- Tremor
Diplopia-Screening exam

- Brainstem, Cranial nerve or neuromuscular junction
- Where is there dysconjugance?
  - At rest, with vergence, with saccades
- Watching extent of eye movements - determining what type of diplopia exists
  - Horizontal - VI nerve palsy
  - Diagonal - IIIrd nerve, IV nerve
  - Variable - neuromuscular junction
Diplopia

- False image (ie. from the paretic eye) is always the most peripheral
- Watch for head tilt (indicating 4\textsuperscript{th} nerve palsy)
- Watch for associated signs (ptosis of 3\textsuperscript{rd} nerve or Horner’s syndrome)
What cranial nerves are affected?
  - CN exam (especially CN 3-7)
Does it localize to brainstem?
  - Corticospinal tract signs, sensory signs
Evidence of neuromuscular dysfunction
  - fatiguability
Question: Is there evidence of radicular dysfunction?

- Motor power, reflexes and sensory exam
- General exam
  - Straight leg raising: L₄-S₁ roots
  - reverse straight leg raising: L₂-L₃ roots
  - contralateral straight leg raising: central disc
Radiculopathy

- Root screen-arm
  - Deltoids-C5
  - Biceps-C5
  - Triceps-C7
  - FE- C7
  - FDI-C8 (ulnar nerve)
  - ADM- C8 (ulnar nerve)
  - APB – C8 (median nerve)
Screening exam

- Iliopsoas - L₁, L₂
- Quadriceps - L₂-₄ (femoral nerve)
- Adductors - L₂-₄ (obturator nerve)
- Hamstrings - L₅-S₁
- Tib. Anterior - L₄-L₅
- EHL - L₅
- Gastroc - S₁
Headache-Screening exam

- Is there raised intracranial pressure?
- Is their focality?
  - Cranial neuropathy
  - Evidence of corticospinal tract lesion/cerebellar dysfunction
- Is there evidence of arteritis?
- Is there evidence of coexisting arthritis?
Tremor-screening exam

- Descriptive
  - Distribution (hands, head, voice)
  - Frequency
  - Amplitude
  - Provocation
- Focused exam
  - Observation for bradykinesia-blink rate
  - Tone change
  - Gait-posture, arm swing pivot
Key references

- Detection of focal cerebral hemispheric lesions using the neurological examination
  - Anderson et al. J NNP 2005 76:545-549

- Tests of Motor Function in Patients Suspected of Having Mild Unilateral Cerebral Lesions
  - Teitelbaum et al CJNS 2002; 29:337-344