The Basic Neurologic Examination

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OBJECTIVES:
Understanding the importance of the basic neurologic history and examination

• To Teach How to Conduct a Basic Neurologic Examination
• Review the Use of Instruments Needed for a Complete NE
• Review Specific Clinical Testing and Techniques
• Discuss Abnormal Findings
• Learn How to Conduct Specific Tests for the Following Disorders:
  Dementia
  Multiple Sclerosis
  Parkinson’s Disease

A mechanic does not need to use every tool on every project
Tools of the Trade

- Steel measuring tape
- Stethoscope
- Flashlight
- Ophthalmoscope
- Tongue blades
- Vials of coffee, salt, sugar
- Cotton wisp
- Two stopped tubes
- Disposable straight pins
- Reflex hammer
- Penny, nickel, dime, key
- Blood pressure cuff
- Forms for various tests

Take a Good HISTORY

- Much of the NE comes from the History
- Assess the Pt's. word articulation, content of speech, and overall mental status.
- Inspect facial features.
- Inspect eye movements, facial movements and any asymmetry.
- Observe how a Pt. swallows saliva and breathes.
- Inspect the posture, look for tremors
- The history and observation can help you focus on specific systems: motor, sensory, cranial nerves or cerebral functions.

Neurologic Examination

- Mental Status Exam
- Cranial Nerve Examination
- Motor Examination
- Reflexes
- Sensory
- Coordination
- Gait
MENTAL STATUS

Level of Consciousness

- Awake and alert
- Agitated
- Lethargic
  - Arousable with
    - Voice
    - Gentle stimulation
    - Painful/vigorous stimulation
- Comatose

Outline of Mental Status Examination

- General behavior and appearance
- Stream of talk
- Mood and affective responses
- Content of thought
- Intellectual capacity
- Sensorium

ORIENTATION

- PERSON
  - NOT WHO THEY ARE BUT WHO YOU ARE
- PLACE
- TIME
LANGUAGE

• FLUENCY
• NAMING
• REPETITION
• READING
• WRITING
• COMPREHENSION

Aphasia vs. dysarthria

Mental Status Exam

• Family story of memory loss
• Orientation
• General Information
• Spelling &/or numbers
• Recognition of objects

Mental Status Exam

• When there is a history of cognitive decline

• What tests?
  – Mini-mental State Examination
  – Halstead-Reitan Performance Test
  – Full Cognitive and Neuropsychological testing
CRANIAL NERVES

CRANIAL NERVE EXAM

• I - OLFATORY
  – DON’T USE A NOXIOUS STIMULUS
  – COFFEE, LEMON EXTRACT

• II - OPTIC
  – VISUAL ACUITY
  – VISUAL FIELDS
  – FUNDOSCOPIC EXAM

C.N. 1 (olfactory)

• Each nostril separately
  – non-irritating substances: ideally coffee/aromatic oils; practically soap/toothpaste
• Anosmia (olfactory) VS. Ageusia (taste)
• First consider nasal disorders

C.N. II (optic)

• Ophthalmoscopy:
  – Optic atrophy, papilledema
• Visual acuity
  – Snellen chart or
  – Hand-held card

  Color Vision
**C.N. II (optic)**

- **Visual fields**
  - Outline perimetry: misses relative defect or inattention
  - Other confrontation techniques (Beck):

**CRANIAL NERVE EXAM**

- **III/IV/VI OCULMOTOR, TROCHLEAR, ABDUCENS**
  - PUPILLARY RESPONSE
  - EYE MOVEMENTS
    - 9 CARDINAL POSITIONS
    - OBSERVE LIDS FOR PTOSIS
  - V - TRIGEMINAL
    - MOTOR - JAW STRENGTH
    - SENS - ALL 3 DIVISIONS

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**Pupillary reflexes (CN 2 & 3)**

- Eyes looking in the distance, bright light
- "Swinging flashlight test"
  - e.g. is there a relative afferent pup. defect?
  - a sensitive test for optic neuropathy
- Horner syndrome (oculo-sympathetic)
  - miosis, ptosis, anhydrosis

**CN 3, 4, 6**

- Parasympathetic (pupillo-constrictor) in CN 3
- CN 3, 4, 6 are under "central" control; Ex:
  - Medial longitudinal fasciculus
    Internuclear ophthalmoplegia: ipsilateral eye fails to adduct, contralateral eye shows nystagmus
  - Frontal eye fields
    Tend to direct gaze contra laterally: with a frontal lesion, eyes are deviated ipsilaterally ("towards the lesion")
Extraocular movements

C.N. 5 (trigeminal)

- Test light touch and/or pinprick in 3 divisions
- Corneal reflex
  - cotton / kleenex on cornea (not conjunctiva)
  - Avoid visual threat
- Palpate contracting masseter & temporalis m
- Jaw jerk

C .N. VII

<table>
<thead>
<tr>
<th>Special visceral efferent</th>
<th>Inspect facial muscles</th>
</tr>
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<tbody>
<tr>
<td>frontalis, corrugator, orbicularis &amp; alae</td>
<td>8 maneuvers</td>
</tr>
<tr>
<td>Buccin., platysma, stapedius</td>
<td>e.g. raise eyebrows, smile, frown, etc.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>General visceral efferent</th>
<th>Inspect eye, Schirmer test</th>
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<tbody>
<tr>
<td>lacrimal gland, submandibular gland</td>
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<tr>
<th>Special visceral afferent</th>
<th>Lacunar test</th>
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<tr>
<td>taste buds, anterior 2/3 tongue</td>
<td>salt, sugar, acetic acid, quinine solutions</td>
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<tr>
<th>General somatic afferent</th>
<th>Test light touch</th>
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<tbody>
<tr>
<td>external ear</td>
<td>in post external ear canal</td>
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CRANIAL NERVES

• VII - FACIAL
  – OBSERVE FOR FACIAL ASYMMETRY
  – FOREHEAD WRINKLING, EYELID CLOSURE,
    WHISTLE/PUCKER
• VIII - VESTIBULAR
  – ACUITY
  – RINNE, WEBER

CRANIAL NERVES

• IX/X - GLOSSOPHARYNGEAL, VAGUS
  – GAG
• XI - SPINAL ACCESSORY
  – STERNOCLEIDOMASTOID M.
  – TRAPEZIUS MUSCLE
• XII - HYPOGLOSSAL
  – TONGUE STRENGTH
  – RIGHT XII THRUSTS TONGUE TO LEFT

Are there dysphonia?
Assess palatal movement with phonation
If there is dysarthria, dysphagia, dysphonia:
  – Test gag reflex
C.N. 11 (spinal accessory)

- Two muscles:
  - trapezius: shoulder shrug; abduction of arm beyond 90 degrees
  - sternocleidomastoid: turn chin to opp shoulder

C.N. 12 (hypoglossal)

- Inspect tongue at rest
  - atrophy, fasciculations
- Tongue protrusion
  - deviation towards paretic side
MOTOR EXAMINATION

STRENGTH

• STRENGTH
  – GRADED 0 - 5
  – 0 - NO MOVEMENT
  – 1 - FLICKER
  – 2 - MOVEMENT WITH GRAVITY REMOVED
  – 3 - MOVEMENT AGAINST GRAVITY
  – 4 - MOVEMENT AGAINST RESISTANCE
  – 5 - NORMAL STRENGTH

STRENGTH EXAM

• UPPER AND LOWER EXTREMITIES
• DISTAL AND PROXIMAL MUSCLES
• GRIP STRENGTH IS A POOR SCREENING TOOL FOR STRENGTH
• SUBTLE WEAKNESS
  – TOE WALK, HEEL WALK
  – OUT OF CHAIR
  – DEEP KNEE BEND
<table>
<thead>
<tr>
<th>MUSCLE OBSERVATION</th>
<th>ABNORMAL MOVEMENTS</th>
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<tbody>
<tr>
<td>• ATROPHY</td>
<td>• TREMOR</td>
</tr>
<tr>
<td>• FASCIULATIONS</td>
<td>- REST</td>
</tr>
<tr>
<td></td>
<td>- WITH ARMS OUTSTRETCHED</td>
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<tr>
<td></td>
<td>- INTENTION</td>
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<td>• CHOREA</td>
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<td></td>
<td>• ATHETOSIS</td>
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<td>• ABNORMAL POSTURES</td>
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<thead>
<tr>
<th>TONE</th>
<th>CEREBELLAR FUNCTION</th>
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<tr>
<td>• INCREASED, DECREASED, NORMAL</td>
<td>• RAPID ALTERNATING MOVEMENTS</td>
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<tr>
<td>• COGWHEELING</td>
<td>• FINGER TO FINGER TO NOSE TESTING</td>
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<tr>
<td>• CLASP KNIFE</td>
<td>• HEEL TO SHIN</td>
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<td></td>
<td>• GAIT</td>
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<td></td>
<td>- TANDEM</td>
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Romberg Sign
- Stand with feet together - assure patient stable - have them close eyes
- Romberg is positive if they do worse with eyes closed
- Measures
  - Cerebellar function
    - Frequently poor balance with eyes open and closed
  - Proprioception
    - Frequently do worse with eyes closed
  - Vestibular system

Gait Evaluation
- Include walking and turning
- Examples of abnormal gait
  - High steppage
  - Waddling
  - Hemiparetic
  - Shuffling
  - Turns en bloc

Gait:
- Normal Walking
- Toe Walking
- Heel Walking
- Inversion Walking
- Eversion Walking
- Tandem Walking
- Romberg

REFLEXES
MUSCLE STRETCH REFLEXES
(DEEP TENDON REFLEXES)

• GRADED 0 - 5
  – 0 - ABSENT
  – 1 - PRESENT WITH REINFORCEMENT
  – 2 - NORMAL
  – 3 - ENHANCED
  – 4 - UNSUSTAINED CLONUS
  – 5 - SUSTAINED CLONUS

OTHER REFLEXES

• Upper motor neuron dysfunction
  – BABINSKI
    • present or absent
    • toes downgoing/ flexor plantar response
  – HOFMAN’S
  – JAW JERK
• Frontal release signs
  – GRASP
  – SNOUT
  – SUCK
  – PALMOMENTAL

MSR / DTR

• BICEPS
• BRACHIORADIALIS
• TRICEPS
• KNEE
• ANKLE

SENSORY EXAM
**SENSORY EXAM**
- VIBRATION
  - 128 hz tuning fork
- JOINT POSITION SENSE
- PIN PRICK
- TEMPERATURE

Start distally and move proximally

**HIGHER CORTICAL SENSATIONS**
- GRAPHESTHESIA
- STEREOGNOSIS
- DOUBLE SIMULTANEOUS STIMULATION
- BAROSTHESIS
- TEXTURES

Mini-Mental State Examination
Halstead-Reitan Battery Test
Cognitive Impairment
Expanded Disability Status Scale
Neurostatus scoring
For Multiple Sclerosis

EDSS: Scoring to Quantify Impairment
Associated with Multiple Sclerosis

0 = Normal neurologic exam
1.0-1.5 = No impairment
2.0-2.5 = Impairment is minimal
3.0-3.5 = Impairment is mild to moderate
4.0-4.5 = Impairment is relatively severe
5.0-5.5 = Increasing limitation in ability to walk
6.0-6.5 = Walking assistance is needed
7.0-7.5 = Impairment is relatively severe
8.0-8.5 = Confined to wheelchair
9.0-9.5 = Confined to bed/chair; self-care with help
10.0 = Death due to MS

Unified Parkinson’s Disease Rating Scale
Comprehensive Parkinson’s Disease Tool

Overview of UPDRS and subscale items
Total UPDRS consists of four parts:

I. Motor examination
   - Fine motor examination
   - Gait
g. Olfaction
   - Palpation

II. Activities of daily living (ADL) speech, swallowing, dressing, eating, hygiene, 
   bladder control, bowel control, personal hygiene

III. Cognitive examination

IV. Complications of therapy
   - Depression
e - freezing
   - Dyskinesias
   - Other

Motor subcales provide a measure of key motor symptoms

Representative sample of key measurement items from the UPDRS scale:

<table>
<thead>
<tr>
<th>Section</th>
<th>Sample Items</th>
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<tbody>
<tr>
<td>Motor 1</td>
<td>Fine motor examination of hand</td>
</tr>
<tr>
<td>Motor 2</td>
<td>Gait, balance</td>
</tr>
<tr>
<td>Motor 3</td>
<td>Olfaction</td>
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<tr>
<td>Motor 4</td>
<td>Palpation</td>
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</tbody>
</table>

UPDRS provides a comprehensive assessment of Parkinson’s disease.
References

- Basic Clinical Neuroscience by P. Young, P.H. Young, D. Tolber, 2008, Lippincott, Williams and Wilkins
- Neurology for Dummies, 2008
- Neuroanatomy Through Clinical Cases, Hal Blumenfeld, 2010