Clinical Evaluation

History

The history is the most important part of the neurologic evaluation. In the paraphrased words of Dr. Marty Samuels, if you get to the end of the history and you don’t know the diagnosis, you probably won’t know it even after ordering a bunch of tests. The history helps determine etiology, most so by the time course of the symptoms (e.g. sudden onset vs. slowly progressive) and by the associated medical context (e.g. many vascular risk factors or known effects of particular chemotherapy agents). In particular, the most important timepoint is often right at the start of symptoms.

*When in doubt—take another history.* Many clinical errors are made because medical jargon is substituted for a patient’s own descriptions, further clouding the actual presentation.

The following outline represents basic information that may be collected in a history.

**Identifying Information (ID)**
- Name
- Medical Record Number
- Contact
- Source of Hx

**Chief Complaint (CC)**
- One liner: Age, Handedness, Sex, Relevant PMH, then Chief Complaint in the patient’s own words

**History of Present Illness (HPI)**
- Character, Onset, Tempo, Location, Radiation, Better, Worse, Prior
- Onset/chronicity, Position, Quality, Radiation, Associations, Transforming factors
- Collateral info

**Review of Systems (RoS)**
- Consciousness, memory loss, forgetfulness, confusion, difficulty concentrating, seizures, intellect, personality, nervousness, anxiety, emotion, irritability, crying spells, mental disease insomnia, sleep disturbances, difficulty w/work, social withdrawal, drug or alcohol problems, trouble w/speech, aphasia vs. dysarthria, mood changes, dysarthria

**Past Medical History (PMH)**
- Prior neuro events, malignancy, vascular risk factors (HTN, DM, CAD, dyslipidemia)

**Past Surgical History (PSH)**
- Surgeries (including approach, implants, & dates)
- Catheterizations (including implants/stents & dates)

**Meds**
- Especially: Antithrombotics, Immunomodulators, psychoactive meds, recreational drugs, and any new drug

**Allergies/Intolerances**
- Meds & reactions

**Family History**
- Parental deaths: age & cause
- Family members w/relevant illnesses

**Social History**
- Baseline functional status: ADLs (basic & instrumental)
- Living situation & social supports
- Occupation
- Tobacco + pack years, EtOH, drugs
- Travel, pets
- Race

**Safety/Abuse Questions**
Have you ever witnessed violence?
Have you ever been hit, kicked, punched, or otherwise physically abused?
Has anyone ever tried to control you by threat or intimidation?
Have you ever felt controlled or isolated by your partner?
Have you ever been forced to perform sexual acts?
Have you ever been taken advantage of financially?
Have you ever been concerned for your safety?

End of Life Discussions

Flight Emergencies

Exam

Superbrief exam: Conversation & tandem walking

In general, abnormal findings on exam are more meaningful than normal findings. (REF: Dr. Venna)

The specificity and PPV of the neuro exam is much higher (0.7-1) than the sensitivity and NPV (0-0.3) for subtle deficits (REF: J Neurol Neurosurg Psychiatry. 2005 Apr;76(4):545-9. PMID: 15774443. http://jnnp.bmj.com/content/76/4/545.full)

Interrater and test-retest reliability (, kappa statistic) (REF: Biometrics 1977;33:159–174) can range from 0.3-0.7 for different exam maneuvers (REF: Neurology 2005;65:1165-1168)


Equipment

Must have

Light
Tuning fork 128Hz+
Reflex hammer

Should have

Stethoscope
Ophthalmoscope
Safety pins
Cotton swabs

General

Vitals

Temp, HR & rhythm, BP, RR, O₂
Fingerstick glucose

ABCs

Probably best to think about this as CAB: Circulation, Airway, & Breathing
Orthostatics

2min lying down -> HR & BP
1min standing -> HR & BP
Severe postural dizziness that precludes measuring vitals is clinically significant
Inc HR 30 clinically significant
Dec SBP 20 probably helpful
Dec DBP 10 probably helpful


Volume Status


(REF: https://www.stanford.edu/group/ccm_echocardio/cgi-bin/mediawiki/index.php/Volume_status)

General

Appearance, distress, grooming

Head

e/o trauma, infection, cranial bruits, bounding pulses, headache location / ttp

Fundi

Anterior chamber, fundi, blood vessels, venous pulsations

Normal

(REF: Adam Cohen, Summerstock 2011)

Cupping

(REF: Adam Cohen, Summerstock 2011)

Pallor

(REF: Adam Cohen, Summerstock 2011)

Swelling
Papilledema

Neck
Supple or rigid, carotid upstroke

Meningismus
Specific: Kernig's: flex hip & knee to 90° -> straighten knee - hamstring pain/resistance?
Specific: Brudzinski's: flex neck (chin to chest) -> involuntary hip flexion?

CV
Rate, rhythm, murmurs, cardiomegaly, JVD, carotid upstroke & bruits

Volume status
Peripheral edema
7 cm prox to the midpoint of the medial malleolus: Highest interrater reliability

Skin
A macular or petechial rash with or without erythema is seen predominantly on the extremities and can become widespread in Rocky Mountain spotted fever (A and B), meningococcal meningitis (C), or syphilis (D).

The vesicular rash of herpes simplex virus reactivation (A) is patchy and that of varicella-zoster virus reactivation (B) is dermatomal. Aphthous ulcers are characteristic of Behçet disease (C and D).

Erythematous macular or maculopapular rashes on the trunk and extremities are seen in infections with West Nile virus (A), enteroviruses (B), and Epstein-Barr virus (C).

Erythema migrans: Lyme disease causes "target" lesions.
**Vascular**
Eyes: HTN changes, narrowing, AV “nicking”
Carotid: upstroke, bruits
Heart: h/o angina, MI, HF, EKG, LVH
PVD: claudication, absent pulses, follicles
Dissection: pain, asymmetric pulse/BP, mediastinum

**Mental Status**
Best to give specific descriptions
Alertness & Attention
Mood & affect, Thought Process & Content

Appearance, affect, & attitude, Disorders of thought (hallucinations, delusions), Disorders of perception, Mood & affect, Insight & judgment, Sensorium & intelligence (REF: utdol.com)

Alert, clouded (inattentive) confused (disoriented), lethargic (drowsy, can be aroused), obtunded (slowed responses, severe stimulation), stuporous (severe, persistent stimulation), comatose (cannot be aroused)

**Mental Status Scales**
Coma & Functional scales: See Altered Mental Status section

**Orientation**
Incorrect year: 86% sens, 94% spec for dementia or delirium. Incorrect year or month 95% sens, 86.5% spec
Worse accuracy correlates w/worse dementia

(REF: [http://jnnp.bmj.com/content/82/5/500.full](http://jnnp.bmj.com/content/82/5/500.full))

**Six Item Screener (SIS)**
Give 3 items to remember (eg, apple, table, & penny) & asked to repeat back
3 pts: Year, month, day of the week
3 pts: Repeat original 3 items
Cognitive impairment: SIS <5/6
(REF: PMID 15995092)

**Quick Confusion Screen (QCS)**
Year 2, Month 2
Repeat & remember: “John Brown, 42 Market Street, New York”
About what time is it? (2 if w/in one hour)
Count from 20 to 1 (2 if correct, 1 if 1 error, 0 if 2 errors)
Months in reverse (2 if correct, 1 if 1 error, 0 if 2 errors)
Repeat memory phrase (5 if correct; -1 for each miss)
Altered cognition & need for further assess: <15/15
(REF: PMID 11593462)

**Short Portable Mental Status Questionnaire (SPMSQ)**
1. What are the date, month, and year?
2. What is the day of the week?
3. What is the name of this place?
4. What is your phone number?
5. How old are you?
6. When were you born?
7. Who is the current president?
8. Who was the president before him?
9. What was your mother's maiden name?
10. Can you count backward from 20 by 3's?

Scoring:
0-2 errors: normal mental functioning
3-4 errors: mild cognitive impairment
5-7 errors: moderate cognitive impairment
8 or more errors: severe cognitive impairment
*One more error allowed if grade school education
*One less error is allowed if > high school


Montreal Cognitive Assessment (MoCA)
More sensitive than MMSE for MCI (90% vs. 18%), slightly less specific (87% vs. 100%)


(REF: http://www.mocatest.org)

Visuospatial Executive: 5
Trails 1
Copy Cube 1
Clock 3: contour, numbers, hands
Naming: 3
Memory/Registration: 0
Attention: 6
Digits 2: fwd 5, bwd 3
Letter tapping 1
Serial 7: 3
Language: 3
Repetition 2
"F" Fluency 1
Abstraction: 2
Delayed Recall: 5
Category cues
Multiple choice cues

Orientation: 6
Date, Month, Year, Day, Place, City

Mini Mental Status Exam (MMSE)
Dementia/Delirium: <24/30
Changes 2 of unclear clinical significance
Not sensitive for mild dementia

May be influenced by age & education, as well as language, motor, & visual impairments (REF: PMID 8598514)


Orientation to time: 5
Year, Season, Month, Date, Day
Orientation to place: 5
State, County, City, Hospital, Floor

Immediate Recall: 3
Apple, Table, Penny
Score first rep but can do up to 6 trials

Attention: 5
Serial 7s: 93, 86, 79, 72, 65

OR

Spelling DLROW

Naming: 2
Watch & Pencil

Repetition: 1
No ifs ands or buts

Three stage command: 3
Take paper, fold it, put it on the floor

Reading & following: 1

Close your eyes

Write a sentence: 1

Copy intersecting pentagons: 1

Long Term Recall: 3
Apple, Table, Penny

Blessed Dementia Information Memory Concentration Test

INFORMATION

Name _______ Age _______ Time (hour) _______ Time of day _______ Day of week _______ Date _______ Month _______ Season _______ Year _______ Place: name _______ street _______ town _______ Type of place (for example, home, hospital, etc.) _______ Recognition of two persons (one point for each) _______
MEMORY

Personal Date of birth _______ Place of birth _______ School attended _______ Occupation _______.
Name of siblings/name of spouse _______ Name of any town where patient worked/lived _______ Name
of employers _______.

Non-personal Date of First World War (1/2 within 3 years) _______.
Date of Second World War (1/2 if within 3 years) _______ Monarch _______ Prime Minister _______.

Five-minute recall (score 0-5 points)

Mr John Brown

42 West Street

Gateshead _______.

CONCENTRATION (all scored 0-1-2)

Months of year backwards _______ Counting 1-20 _______ Counting 20-1 _______.

TOTAL _______.

Attention

Simple digit repetition, w/or w/o reversal of those digits, is commonly used. Most people can easily repeat
6 or 7 digits, & can easily reverse 4 digits.

Spelling "WORLD" backwards, or alphabetizing the letters in "WORLD" is also used as a screen for
attention (REF: PMID 9409339)

Impaired sustained attention: Hallmark of acute confusional state. 2/2 Diffuse dysfunction, frontoparietal
dysfunction (R>L)

Apathy: medial frontal or dPFC. B ACA stroke, AD, bvFTD, PSP. Treated w/stimulants, dopamine
agonists

Akinetic mutism: Medial frontal cortex, globus pallidus. Catatonia

Comportmental problems

Orbitofrontal dysfunction: social disinhibition, antisocial behavior, OCD, hoarding

Klüver-Bucy Syndrome: hyperorality, hypersexuality, hypermetamorphosis, visual agnosia, blunted affect.
B medial temporal lesions including amygdaloid complexes (HSB, anoxia, FTD, B lobectomy)

Kleine-Levin: hypothalamic

Gastaut-Geschwind: hypergraphia, hypososexuality, hyperreligiosity, interpersonal viscosity

Insula: perception & recognition of disgust. Lesions may abolish addiction to smoking

Memory

Episodic: events

Temporolimbic amnesia: more remote memories more preserved

Near immediate registration

Delayed spontaneous recall

Cued recall ~ recognition

“Frontal” amnesia (encoding & retrieval) usually recognition is more spared than recall (FTD, subcortical
dementias)

Semantic: meaning, facts

Lateral temporal, temporopolar cortices

Procedural memory

Basal ganglia, cerebellum
Reduplicative paramnesia
Delusion that a place has been duplicated and relocated
B frontal & R parietal

Psychogenic amnesia
Loss of remote &/or autobiographical memory
Intact new learning ability

Testing
Current president
Current events
Recent news items

Agnosia
Inability to recognize things despite integrity of elementary sensory pathways
Prosopagnosia: face problems, FFA, B occ temporal cortex (ventral visual stream)
Anosognosia: lack of awareness of one’s deficits, R/nondominant parietal
Anosopiaphoria: Awareness but indifference of deficits, R hemisphere
Asomatognosia: denies ownership of limb, nondominant supramarginal gyrus

Visuospatial
Achromotopsia: ventral temporal ststream (V4?), superior quadrantopsis w/PCA
Balint syndrome: inability to move visual attention (dorsal parietal): simultagnosia, optic ataxia, oculomotor apraxia (B occipitoparietal lesions, watershed infarcts, PCA, PML, PRES
Gesstman: agraphia, acalculia, R/L confusion, inability to name fingers, L parietal lesion (inferior parietal lobeus, angular, supramarginal gyr)
Anton’s syndrome: blindness w/denial. B occipital lesions
Blindsight: Believe blind, but some perception on forced testing
Charles Bonnet: complex vivid visual hallucinations 2/2 afferent damage
Topographic disorientation: impaired orientation & navigation. R post parahippocampal, R parietal

Praxis/Apraxia
Screw in a light bulb, comb hair, brush teeth
Inability to perform learned motor task despite integrity of rudimentary pathways (sensory, motor, motivational)
Loc: frontal & parietal, usually L hemisphere, usually contralateral to handedness
Callosal apraxia: in callosum, inability to pass info to nondominant hemisphere, manifests as nondominant hand
Buccofacial apraxia: inability to perform skilled movements w/mouth/face/tongue (usually co-occur’s w Broca’s)

Mixed Executive
Draw a clock

Frontal
Luria diagram
Go-NoGo (hold up 1 figure when examiner holds up 2)
Abulia / affect


Parietal

Gaze preference, extinction

Naming, Agnosia

Cross-body commands


Language

Fluency / Comprehension / Repetition

<table>
<thead>
<tr>
<th></th>
<th>Fluent</th>
<th>Comprehension</th>
<th>Repetition</th>
<th>Loc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>Non-fluent</td>
<td>Impaired</td>
<td>Impaired</td>
<td>L Dom Hemis (ant &amp; post)</td>
</tr>
<tr>
<td>Transcort Mixed</td>
<td>Non-fluent</td>
<td>Impaired</td>
<td>Intact</td>
<td>Both areas</td>
</tr>
<tr>
<td>Broca’s</td>
<td>Non-fluent</td>
<td>Intact</td>
<td>Impaired</td>
<td>L Inf Frontal</td>
</tr>
<tr>
<td>Transcort Motor</td>
<td>Non-fluent</td>
<td>Intact</td>
<td>Intact</td>
<td>Peri-Broca, SMA</td>
</tr>
<tr>
<td>Wernicke’s</td>
<td>Fluent</td>
<td>Impaired</td>
<td>Impaired</td>
<td>Sup temp</td>
</tr>
<tr>
<td>Transcort Sensory</td>
<td>Fluent</td>
<td>Impaired</td>
<td>Intact</td>
<td>L P-T junction, peri-Wernicke</td>
</tr>
<tr>
<td>Conduction</td>
<td>Fluent</td>
<td>Intact</td>
<td>Impaired</td>
<td>Arcuate fasciculus</td>
</tr>
<tr>
<td>Pure Word deaf</td>
<td>Fluent</td>
<td>Intact?</td>
<td>Impaired</td>
<td>Sup temp</td>
</tr>
<tr>
<td>Anomic</td>
<td>Fluent</td>
<td>Intact</td>
<td>Intact</td>
<td>Ant Temp</td>
</tr>
</tbody>
</table>

Aphasia syndromes

(REF: http://www.uptodate.com/contents/image?imageKey=NEURO%2F72780&topicKey=NEURO%2F5106&rank=2~150&source=see_link&search=language&udtPopup=true)

<table>
<thead>
<tr>
<th>Syndrome</th>
<th>Flu</th>
<th>Rep</th>
<th>Co</th>
<th>mp</th>
<th>R</th>
<th>ead</th>
<th>W</th>
<th>rite</th>
<th>Localization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td>Large MCA or left carotid inclusions infarcting a vast region of the left hemisphere</td>
</tr>
<tr>
<td>Broca's</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td>&quot;Broca's&quot; area- left inferior frontal, often anterior MCA branch occlusion</td>
</tr>
<tr>
<td>Transcortical motor</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td>Left mesial frontal, especially supplementary motor area; anterior cerebral artery occlusion; ACA/MCA border zone</td>
</tr>
<tr>
<td>Conduction</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>±</td>
<td></td>
<td></td>
<td>Superior temporal gyrus, inferior parietal region adjacent to temporal lobe; classically in arcuate fasciculus</td>
</tr>
<tr>
<td>Transcortical mixed</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td>Anterior and posterior watershed zones, effectively disconnecting perisylvian cortex from other cortical regions</td>
</tr>
<tr>
<td>Wernicke's</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td>&quot;Wernicke's&quot; area- left superior temporal and inferior parietal region, often posterior MCA branch occlusion</td>
</tr>
<tr>
<td>Transcortical sensory</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td>Left posterior watershed zone between MCA and PCA territories</td>
</tr>
<tr>
<td>Pure word deafness</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td>Left or bilateral superior temporal gyrus lesions</td>
</tr>
<tr>
<td>Pure alexia</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td></td>
<td></td>
<td>Left occipital lobe with involvement of splenium of corpus callosum</td>
</tr>
<tr>
<td>Aphemia</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td>Motor cortex outflow to articulators</td>
</tr>
<tr>
<td>Pure agraphia</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td>Left inferior frontal region</td>
</tr>
</tbody>
</table>
Anomic | + | + | + | ± | Temporal, parietal, and occipital regions of cortex outside of classical language areas

Localization: transcortical aphasia: can be subcortical in localization, esp thalamus

Aprosodia: Unable to regulate or recognize affective qualities of speech: R hemisphere analogous to dominant hemisphere localization

Pure word deafness: Unimodal auditory association area, dominant hemisphere (sup, mid temp gyri)

Alexia w/out agraphia: disconnect visual word form areas from Wernicke’s area (comprehension). Loc: L occipital & splenium of corpus callosum, often L PCA stroke

Surface Dyslexia: reading: inability to read words that aren’t spelled the way they sound (dug for dough)

Deep Dyslexia: reading: semantic (river as ocean) or visual (think for thing) errors

Aphemia: impaired speech, preserved writing: loc L premotor cortex

Apraxia of speech: variable errors, repeated attempts to pronounce words impair normal flor & prosody (tau neurodegenerative diseases: agrammatic PPA, PSP, CBD)

Word generation

By category (market items, animals)
By initial letter (F, A, S)

(REF: http://www.neurology.org/content/62/4/556.abstract)


Videos

Broca
http://www.youtube.com/watch?v=gocIuW3E-go
http://www.youtube.com/watch?v=i2fMEbMnPMM

Wernicke
http://www.youtube.com/watch?v=aVhYN7NTIKU
http://www.youtube.com/watch?v=dKTdMV6cOZW

Activities of Daily Living (ADLs)


Basic Activities of Daily Living (self-care)

Walking
Bathing
Dressing
Toileting
Maintaining continence
Grooming
Feeding
Transferring

Instrumental ADLs (maintaining independent household):


Shopping for groceries
Driving or using public transportation
Using the telephone
Performing housework
Doing home repair
Preparing meals
Doing laundry
Taking medications
Handling finances

By Region

Dorsolateral Prefrontal Cortex (DLPFC)
Set shifting: Trails B: A-1-B-2-C-3…
Motor Sequencing: Luria sequence: Palm-Fist-Edge-Palm… (3 times show & say, 3 times say, 3 times pt do)
Calculations: From arithmetic -> complex word problems
Word generation: esp by letters (hard for pts w/lesions to organize complex word generation/without strategy)

Orbitofrontal Cortex (OFC)
Impulsive: Iowa gambling task
Morality: scenarios?

Anterior Cingulate Cortex (ACC)
Motivation: apathy, abulia, amotivated mutism
Compulsive: hoarding behaviors

Frontal Eye Fields (FEF)
Gaze shifts: voluntary, tracking, orientation
Optokinetic strip nystagmus testing (OKN)

Frontoparietal
Attention tasks

Perisylvian
Dominant hemisphere: aphasia
Receptive aphasia: posterior/superior temporal, Wernicke
Expressive: anterior/inferior frontal, Broca

Cranial Nerves

Rule of 4s
There are 4 structures in the midline starting w/the letter M.
There are 4 structures in the lateral brainstem starting w/the letter S.
The lower 4 cranial nerves are in the medulla, the middle 4 cranial nerves are in the pons and the first 4 cranial nerves are above the pons, w/the third and 4th in the midbrain.
The 4 motor cranial nerves that are in the midline are the 4 that divide evenly into 12 (except for 1 and 2)—that is, 3, 4, 6 and 12.
Under Sedation

Absent corneal and cough reflexes predict mortality, absent oculocephalic predicts altered mental status


I: Olfactory

- Oil of peppermint on a cotton ball
- Coffee grounds in small tube
- Test each nostril independently

II: Optic

- Color, Acuity, Confrontation testing (cover one eye, bring one red or white pin from the periphery in all 4 quadrants)

MRI Axial T1 (REF: Adam Cohen, Summerstock 2011)

Hippus

Also known as pupillary athetosis?


Hippus occurs in macaque monkeys with longer duration stimuli


II/III: Pupillary Reaction to Light

Pupil size & shape at rest. Bring a dim flashlight from below to illuminate one pupil, & then another, look for a consensual response, & then swing the flashlight between each eye.

Afferent pupil defect: decreased direct response in the affected eye; eye dilates in response to light.

Accommodation: pupils constrict while fixating on an object moving closer, easier to focus when point is in the inferior visual fields, such as tip of nose

Physiological anisocoria: pupils constrict in light, dilate in the dark

Ptosis: always worse on affected side but may be fooled by proptosis or lower lid weakness

<table>
<thead>
<tr>
<th>Pupils</th>
<th>Palsy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parasympathetic</td>
<td>Iris à IIId nerve à Midbrain</td>
</tr>
<tr>
<td></td>
<td>(severe ptosis)</td>
</tr>
<tr>
<td>Sympathetic</td>
<td>Iris à Ophthalic V1 trigemenal nerve à Internal carotid -&gt; C2 -&gt; IML Cord -&gt; Hypothalamus</td>
</tr>
<tr>
<td></td>
<td>(Horners)</td>
</tr>
<tr>
<td></td>
<td>L Horners</td>
</tr>
<tr>
<td></td>
<td>(mild ptosis ± anhydrosis)</td>
</tr>
</tbody>
</table>

10% cocaine – should dilate normal pupils after 60 mins, will not affect Horners


III: Oculomotor

IV: Trochlear

VI: Abducens

Ask pt to look up, down, left & right.

Cover test: look to the extreme, & cover each eye. Covering the affected eye obliterates the outer image.

4th nerve palsy: Diplopia on looking down, & in (stairs, reading).

6th nerve palsy: pt may shut the lid of the affected eye

Pontine gaze centers: (Paramedian pontine reticular formation):

Test each eye independent, look for full isolated movements w/disconjugate gaze on lateral gaze

Paralysis of medial recti (divergent squint)

Failure of adduction: MLF between III & IV

Failure of abduction: MLF between IV & VI

Nystagmus: Resting, horizontal, vertical, rotatory

Peripheral: fast side away from lesion, w/vertigo,

Central: + vertical / rotatory
**V: Trigeminal**

Facial sensation: (Vth nerve), typically w/unilateral face pain (tic douloureux), earliest sign: decreased corneal reflex. Tap on cheek, jaw, try to elicit pain.

(REF: Adam Cohen, Summerstock 2011)

5->7: corneal reflex w/saline drops, cotton swab, nasal irritation, TMJ pressure

**VII: Facial**

Facial movements: Masseter (V); everything else (VII). Upper motor neuron: lower face, Lower motor neuron: whole left side. Check platysma. Taste of the anterior 2/3 of tongue (saccharin on a Q-tip)

**VIII: Vestibulocochlear**

512 HZ tuning fork. Finger rubs, whisper in each ear (can try to distract opposite ear), watch tick for high frequency

Rinne: 512 Hz in the air, & then on the sternoclinoid process.

Weber: 512 Hz in the middle of the forehead, louder in affected ear

<table>
<thead>
<tr>
<th>Rinne AC &gt; BC Both</th>
<th>Weber L</th>
<th>Weber R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Sensorineural R</td>
<td>Sensorineural in R</td>
</tr>
<tr>
<td>L BC &gt; AC</td>
<td>Conducting in R</td>
<td>Combined</td>
</tr>
<tr>
<td>R BC &gt; AC</td>
<td></td>
<td>Conductive in R</td>
</tr>
</tbody>
</table>

Dix-hallpike: Look for nystagmus / dizziness w/rapid change in position

Head Impulse Test: Move the head rapidly through 90º of horizontal arc; if eyes do not saccade smoothly, then abnormal

**IX/X: Glossopharyngeal/Vagus**

Palate elevation (X), gag (IX in, X out). Sensation around the palate IX.

**XI: Spinal Accessory**

Sternoclinomastoid / upper trapezius; look for wasting

**XII: Hypoglossal**

Tongue movements; deviation toward the side of the lesion

Look for fasciculations

**Motor/Coordination**

**Speed**

Bradykinesia, akinesia, hypokinesia, hyperkinesia

**Bulk**

Wasting: temporal, thenar, quads

"Muscle atrophy is a feature of all lower motor neuron disorders and many muscle diseases." (REF: Patter’s Neurological Differential Diagnosis)

Myopathy exceptions: “pseudohypertrophy, hypertrophy 2/2 myotonia, compensatory hypertrophy in unaffected muscles in some of the ocaized myopathies”

**Tone**

Hypotonia
Spasticity: depends on position and speed of movement. Clasp-knife = free movement, then catch requiring force, then free movement again

Rigidity: increased resistance throughout. Lead-pipe = uniform. Cogwheel = rhythmic interruption/ratchet effect. Usually accentuated by distraction

Paratonia (gegenhalten): resistance that is less prominent w/distraction (esp dementia or anxiety)

(REF: http://www.uptodate.com/online/content/topic.do?topicKey=genneuro/2959)

**Involuntary movements**

Where: structures or segments involved

When: state of muscles when movts occur: at rest, maintaining posture, or during goal-directed movements

What: description of movt, pattern of involvement of segments, duration, frequency

Why: factors which increase or decrease movements: rest, exercise, anxiety, alcohol


**Brief Version**

Tremor: involuntary rhythmic movement, usually worst w/either rest, postural, action, intention.

Tic: brief, stereotyped, repetitive movement under partial voluntary control

Chorea: flowing, irregular/arrhythmic, unsustained and involuntary set of movements

Athetosis: slow, writhing movement characterized by the transition from one abnormal posture to another

Ballism: sudden violent jerking movement of the entire limb (STN)

Dystonia: prolonged and sustained (focal, segmental or generalized) muscle contraction

Myoclonus: brief and rapid/shock-like contraction of a muscle or muscle group

Asterixis: sudden loss of sustained tonic contraction of a muscle or muscle group.

Bradykinesia: slow voluntary movements

**Chorea**

Restless fidgeting or purposeless movements of the arms early sign

Break or interruption of smooth voluntary movement

Sudden grimaces: unable to keep tongue protruded, darts in and out

Sydenham's chorea: associated w/rheumatic fever

Huntington's chorea: autosomal dominant disorder usually in adulthood

Chorea gravidarum: pregnancy

Lupus w/cerebral arteritis?

**Athetosis**

Sinuous, writhing movements, especially hands

Child: bilateral 2/2 neonatal cerebral hypoxia

Adult: unilateral 2/2 stroke

**Myoclonus**

Sudden brief twitches or jerks of groups of muscles (esp shoulders, hands)

Esp metabolic encephalopathies

**Asterixis**
Arrhythmic lapses of sustained posture

Movement is actually caused by gravity or inherent elasticity

Pathophys: EEG sharp wave from motor cortex? -> EMG silence 35-200ms

Arm posture: arms outstretched, hands dorsiflexed, fingers extended/abducted

Hip joints: hips passively flexed, abducted 60-90° btw thighs

Feet: dorsiflex feet & maintain

Can also be seen in any muscle group or w/passive extension

Usually wanes w/deeper coma


(REF: Adams & Victor, p96-97) (REF: Brazzi’s p615)

Tremor

Alternating contractions of opposing muscle groups

Parkinsonism: pronation/supination in forearm, pill-rolling in thumb/index fingers. Coarse regular movement, usually arm->face/tongue->leg. Present at rest, inc w/emotion & walking, dec w/sleep & action

Proximal postural tremors: neck, shoulder, pelvis. Coarse, slow. Usually cerebellum or connections

Distal postural: wrists, fingers. Fine, rapid. Mibrain or BG pathology, anxiety/fatigue, thyroid

Essential tremor: fingers, hands, voice, head, neck. Coarse, irregular. Worse w/goal-directed movement, Better w/alcohol. Heritable

Action (intention) tremor: Manifested in finger, but origin is in elbow or shoulder joint. Coarse, irregular, side-to-side/perpendicular to movement (3Hz horizontal?). Most prominent near end of goal-directed movement. May be more noticeable w/disorders of cerebellar connections (peduncles) than parenchyma (hemispheres) (REF: Patten)

Voice: spontaneous speech, count 1-10, ‘eeeee’

Myokymia


Definition

Continuous, rhythmic, undulating movements of muscle fibers visible as vermiform movement of the overlying skin

Discriminating characteristics

Mostly rhythmic twitching of the same part of the muscle. The twitches have a predictable pattern

Associated disorders

Focal myokymia

Guillain–Barré syndrome

Multiple sclerosis

Radiation plexopathy

Pontine tumors

Neoplastic/inflammatory meningoradiculitis

Ischemic rhombencephalopathy
Syringobulbia
Basilary impression
Cardiopulmonary arrest
Subarachnoid hemorrhage
Persistent facial myokymia
Generalized myokymia
Dendrotoxin
Episodic ataxia w/myokymia (EA1)
Chronic inflammatory demyelinating polyneuropathy (CIDP)
With neuromyotonic discharges
Isaacs’ syndrome
Morvan syndrome
Schwartz–Jampel syndrome
Pharmacological inducers
Clozapine
Gold
Penicillamine

Fasciculations

Definition

Random, spontaneous twitching of a group of muscle fibers belonging to a single motor unit

Discriminating characteristics

Irregular twitches that move along the muscle fiber. Visible in the peripheral field of vision, but never seem to originate where expected

Associated disorders

Fasciculation syndromes
Benign spontaneous fasciculations
Fasciculations following exercise
Benign fasciculation syndromes
Motor neuron disorders
Amyotrophic lateral sclerosis
Radiculopathy
Multifocal motor neuropathy
Peripheral neuropathy
Entrapment neuropathy
Spinal muscular atrophy
Radiation plexopathy
Syringomyelia
Creutzfeldt–Jakob disease
Metabolic disorders
Thyrotoxicosis
Hypomagnesemia
Tetany
Pharmacological inducers
Anti-cholinesterase drugs
Anesthetic muscle relaxants
Caffeine
Theophylline
Terbutaline

Spasms


Definition
Sudden involuntary and painful shortening of muscle, attended by visible or palpable knotting of muscle, often w/abnormal posture of the affected joint. Relieved by passive stretching or massage

Discriminating characteristics
Self-limiting in minutes. Can be relieved by stretching or massage. Very painful. Abnormal posture of affected joint

Associated disorders
Benign
Sporadic
After exercise
Nocturnal leg cramps
Diseases and disorders
Amyotrophic lateral sclerosis
Motor neuropathies
Spinal stenosis
Water and electrolyte disturbances
Cirrhosis
Kennedy’s disease
Syndromes
Isaac syndrome
Morvan syndrome
Pain-fasciculation syndrome
Cramp-fasciculation syndromes
Familial cramp syndromes
HANAC syndrome
Postpolio syndrome
Pharmacological inducers
Clofibrate
Fenofibrate
Bezafibrate
Vincristine
Diuretics
-agonists (salbutamol, terbutaline, pindolol)
Angiotensin-converting enzyme inhibitors
Calcium channel blockers (nifedipine)
Hormone treatment
Penicillamine
Insulin
Ethanol
Caffeine

Macromotor movements

Arm
Pronator drift: eyes closed, both arms outstretched, elbows/wrists extended, forearms supinates, spread fingers apart x 10-15 sec. Look for a) slow wrist pronation w/slight elbow flexion or b) downward and lateral drift of hand (REF: A clinical examination technique for mild upper motor neuron paresis of the arm. Neurology 2000;54:531–532.)

Pronator drift: As above but keep fingers together first x 15 sec. Look for a) little finger abduction or b) finger spreading (REF: A clinical examination technique for mild upper motor neuron paresis of the arm. Neurology 2000;54:531–532.)

Shoulder shrug test: compare bilateral movement speed

Rapid finger movement: tap tip of the thumb and index finger x 10 sec

Rapid finger movement: tap thumb sequentially w/each finger (thumb to all fingers)

Rapid alternating movement: extend and flex fingers x 10 sec (“fist open/close”)

Rolling/Orbiting: rotate forearm or index fingers around each other x 5 sec each direction (REF: Asymmetry of forearm rolling as a sign of unilateral cerebral dysfunction. Neurology 1993;43:1596–1598.) (REF: http://jnnp.bmj.com/content/10/1/39.full)

Finger-to-nose test

Rapid alternating movement: pat thigh w/dorsum or palm x 10 sec (flip hand over and over) (REF: J Neurol Neurosurg Psychiatry. 2005 Apr;76(4):545-9. PMID: 15774443. http://jnnp.bmj.com/content/76/4/545.full)

Writing: Archimedes spiral or same sentence at each visit

Tapping rhythms (eg. Shave & a haircut, 2 bits)

Leg


Leg drift x 5 sec


Rapid alternating movement: tap floor w/forefoot while heel rests on floor. Can also do heel tapping

Rapid alternating movement: shake each foot up and down x 5 sec

Foot in the slipper test

Bicycling movements
Heel-knee-shin test
Get up from a chair without using arms

**Strength**
MRC Rating Scale
5: Full resistance
4±: Partial resistance
3: Antigravity
2: Movement isolated from gravity
1: Contraction
0: No contraction

**Stamina**
Strength is less affected than stamina by non-pathologic processes: aging, generalized weight loss, disuse

Quads "may show appreciable wasting within day of the patient being confined to bed".

"Disuse atrophy affects stamina and not strength."
(REF: Patten's Neurological Differential Diagnosis)

**Arms**

<table>
<thead>
<tr>
<th>Action</th>
<th>Root</th>
<th>Muscle</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder abduction (1st 90)</td>
<td>C5</td>
<td>Supraspinatus</td>
<td>Suprascapular</td>
</tr>
<tr>
<td>Shoulder abduction (2nd 90)</td>
<td>C5</td>
<td>Deltoid</td>
<td>Axillary</td>
</tr>
<tr>
<td>Shoulder external rot</td>
<td>C5</td>
<td>Infraspinatus</td>
<td>Suprascapular</td>
</tr>
<tr>
<td>Shoulder internal rot</td>
<td>C5</td>
<td>Subscapular/Teres minor</td>
<td>Subscapular</td>
</tr>
<tr>
<td>Shoulder adduction</td>
<td>C7</td>
<td>Lattisimus dorsi/Pecs</td>
<td></td>
</tr>
<tr>
<td>Elbow flex (half supinated)</td>
<td>C5±6</td>
<td>Biceps/Brachialis</td>
<td>Musculo-cutaneous</td>
</tr>
<tr>
<td>Elbow flex (half pronated)</td>
<td>C6±5</td>
<td>Brachioradialis</td>
<td>Radial</td>
</tr>
<tr>
<td>Elbow pronation</td>
<td>C6</td>
<td>Pronators teres/quadratus</td>
<td>Median/Ant Inteross</td>
</tr>
<tr>
<td>Elbow supination</td>
<td>C6</td>
<td>Supinator</td>
<td>Radial</td>
</tr>
<tr>
<td>Elbow ext</td>
<td>C7</td>
<td>Triceps</td>
<td>Radial</td>
</tr>
<tr>
<td>Wrist flex</td>
<td>C7-8</td>
<td>Forearm muscles</td>
<td>Median</td>
</tr>
<tr>
<td>Wrist flex</td>
<td>C7-8</td>
<td>Flex carpi ulnaris</td>
<td>Ulnar</td>
</tr>
<tr>
<td>Wrist ext</td>
<td>C7±6</td>
<td>Extension muscles</td>
<td>Radial</td>
</tr>
<tr>
<td>Finger ext</td>
<td>C8</td>
<td>All extensors</td>
<td>Radial</td>
</tr>
<tr>
<td>Finger flex</td>
<td>C8</td>
<td>FDP 2-3/4-5</td>
<td>Median/Ulnar</td>
</tr>
<tr>
<td>Finger pinch</td>
<td>C8</td>
<td>Long flexor D1&amp;2</td>
<td>Anterior interosseus</td>
</tr>
<tr>
<td>Thumb abduction</td>
<td>T1</td>
<td>Abd pollicis brevis</td>
<td>Median</td>
</tr>
<tr>
<td>Finger abduction</td>
<td>T1</td>
<td>Interossei &amp; Abd dig minimi</td>
<td>Ulnar</td>
</tr>
</tbody>
</table>

(REF: Patten)

**Legs**

<table>
<thead>
<tr>
<th>Action</th>
<th>Root</th>
<th>Muscle</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip flex</td>
<td>L2-3</td>
<td>Ilio-psoas</td>
<td>Direct nerve</td>
</tr>
<tr>
<td>Hip ext</td>
<td>L4-5</td>
<td>Glutei</td>
<td>Gluteal</td>
</tr>
<tr>
<td>Hip abduct</td>
<td>L4-5</td>
<td>Glutei &amp; tensory fascia latae</td>
<td></td>
</tr>
</tbody>
</table>
Hip adduct | L2-4 | Adductors | Obturator
Knee ext | L2-4 | Quads | Femoral
Knee flex | L5-S1 | Hamstrings | Tibial
Dorsi flex | L4-5 | Tib ant, long ext, peroneus, EDB | Peroneal
Plantar flex | S1-2 | Gastroc & tib post | Tibial
Foot inversion | L4 | Tib ant & tib post | Tibial (& peroneal?)
Foot eversion | S1 | Peronei longus & brevis, Long extensors, EDB | Peroneal

(REF: Patten)


Upper Motor Neuron (UMN) vs. Lower Motor Neuron (LMN)

Atrophy and fasciculations are common w/lower motor neuron disease and unusual w/upper motor neuron disease

<table>
<thead>
<tr>
<th>Reflexes</th>
<th>Pattern</th>
<th>Tone</th>
<th>Wasting</th>
</tr>
</thead>
<tbody>
<tr>
<td>UMN</td>
<td>Hyper</td>
<td>Arm ext, leg flex, supination (pronation wins)</td>
<td>Inc</td>
</tr>
<tr>
<td>LMN</td>
<td>Hypo</td>
<td>Distal weak</td>
<td>Dec</td>
</tr>
<tr>
<td>Muscle</td>
<td>Hypo</td>
<td>Proximal weak</td>
<td></td>
</tr>
</tbody>
</table>

Blink Rate


Sensory

Always test sensation w/eyes closed (subconscious cheating)
Test distal to proximal, pathologic to normal

(REF: Dr. Venna)

Light Touch

10g monofilament
Dorsal Column

Vibration 128 Hz: Grade: time until lose sensation. Location: 1st toe (~8sec), medial malleolus (~12sec), knee, iliac crest; 2nd finger, wrist, elbow, clavicle

Proprioception: Grade: angle required to sense reliably >75% or #correct/10 for 1cm/1 sec

Vibration usually lost before proprioception in peripheral disease

Can lose proprioception before vibration in parietal lesions

Index finger has smallest cortical representation?


Monofilament: pressure sensation w/5.07 Semmes-Weinstein monofilament (apply until buckles, x1 sec). 5 plantar sites: toes 1 & 4, metatarsals 1, 3, 5

Peripheral Neuropathy

<table>
<thead>
<tr>
<th></th>
<th>PN-</th>
<th>PN+</th>
<th>Spec</th>
<th>Sens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achilles</td>
<td></td>
<td>90.6</td>
<td>72.1</td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>3</td>
<td>49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>29</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patella</td>
<td></td>
<td>100</td>
<td>13.2</td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>0</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>32</td>
<td>59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vib: toe</td>
<td></td>
<td>75</td>
<td>95.6</td>
<td></td>
</tr>
<tr>
<td>Dec (&lt;8s)</td>
<td>8</td>
<td>65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nl (8s)</td>
<td>24</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vib: ankle</td>
<td></td>
<td>83.9</td>
<td>75.0</td>
<td></td>
</tr>
<tr>
<td>Dec (&lt;12s)</td>
<td>5</td>
<td>51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nl (12s)</td>
<td>27</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pos: toe</td>
<td></td>
<td>68.8</td>
<td>88.2</td>
<td></td>
</tr>
<tr>
<td>Dec (&lt;8/10)</td>
<td>10</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nl (8/10)</td>
<td>22</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pos: ankle</td>
<td></td>
<td>100</td>
<td>24.1</td>
<td></td>
</tr>
<tr>
<td>Dec (&lt;8/10)</td>
<td>0</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nl (8/10)</td>
<td>32</td>
<td>54</td>
<td></td>
<td></td>
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<tr>
<td>Romberg</td>
<td></td>
<td>100</td>
<td>17.6</td>
<td></td>
</tr>
<tr>
<td>Abnl (&lt;30s)</td>
<td>0</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nl (30s)</td>
<td>32</td>
<td>56</td>
<td></td>
<td></td>
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<tr>
<td>UPS (n=75)</td>
<td></td>
<td>55.6</td>
<td>80.7</td>
<td></td>
</tr>
<tr>
<td>Dec (&lt;10s)</td>
<td>8</td>
<td>46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nl (10s)</td>
<td>10</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MDNS (n=57)</td>
<td></td>
<td>77.8</td>
<td>93.8</td>
<td></td>
</tr>
<tr>
<td>Inc (10)</td>
<td>2</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nl (&lt;10)</td>
<td>7</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Nociceptive
Pinprick (sharp vs. dull on 90 degree bent safety pin)
Temp: cold tuning fork, glove w/ice
Deep Pain: Achilles tendon pressure, pretibial pressure, testicular pressure (tabes dorsalis)

Synthetic sensory function
Tactile identification (coin)
Double simultaneous stimulation
Graphesthesia
Sensory ataxia

Reflexes

Technique
(REF: DeJong’s The Neurologic Examination)
Strike should be quick, direct, crisp & forceful, but no greater than necessary
Flick of the wrist
Common faults: index finger on top of the handle; using primarily elbow motion; timid, decelerating blow/pulling back at end
Position: midway in the range of motion of the muscle to be tested/passive stretch slightly
Feel or see contraction (look for muscle contraction, not just for movement)

Grading
(REF: Marty Samuels)
0: Absent
1: Requires reinforcement to elicit
2: Normal
3: Hyperreflexic (sometimes associated w/spreading)
4: Hyperreflexic + clonus

Reinforcement
Clenching fists
Pulling hands apart (Jendrassik maneuver, lasts 1-6 sec, max @300ms)
Biting down
Tightly closing eyes

Deep Tendon Reflexes (DTR)

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Spinal Level</th>
<th>Peripheral Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pectoralis</td>
<td>C5-T1</td>
<td>Med &amp; lat pectoral (ant thoracic)</td>
</tr>
<tr>
<td>Biceps</td>
<td>C5&gt;6</td>
<td>Musculocutaneous</td>
</tr>
<tr>
<td>Brachioradialis</td>
<td>C5&gt;6</td>
<td>Radial</td>
</tr>
<tr>
<td>Triceps</td>
<td>C7&gt;8</td>
<td>Radial</td>
</tr>
<tr>
<td>Reflex</td>
<td>Nerve</td>
<td>Spinal Level</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Finger jerk</td>
<td>C8</td>
<td>Median &amp; Ulnar</td>
</tr>
<tr>
<td>Thigh adductor</td>
<td>L3</td>
<td>Obturator</td>
</tr>
<tr>
<td>Quads</td>
<td>L3-L4</td>
<td>Femoral</td>
</tr>
<tr>
<td>Medial hamstring</td>
<td>L5-S1</td>
<td>Tibial division of sciatic nerve</td>
</tr>
<tr>
<td>Gastroc/Achilles</td>
<td>S1</td>
<td>Sciatic</td>
</tr>
</tbody>
</table>

(REF: DeJong’s The Neurologic Examination)
(REF: Patten)

Achilles

Mixed data on reliability


Plantar reliability > Tendon for students but not attendings (REF: J Neurol Neurosurg Psychiatry. 2003 Sep;74(9):1351-2. Comparison of the tendon and plantar strike methods of eliciting the ankle reflex. PMID: 12933960. [http://jnnp.bmj.com/content/74/9/1351.long](http://jnnp.bmj.com/content/74/9/1351.long))

Other

Pronator Teres


Abdominal

Cremasteric reflexes: L1-2

Hamstring: L5

Anal wink: S2-4

Babinski

Reflex arc: S1 dermatome skin receptor endings -> tibial nerve -> L4-S2

Muscles: EHL, TibAnt, EDL, hamstrings, tensor fascia latae

Response: dorsiflexion (extension) of big toe, then fanning out and extension of the other toes, dorsiflexion of the ankle and flexion of the hip and knee joint, possible internal rotation & abduction


Sensitivity 35%, specificity 77%, validity 56%, 0.30 (REF: Neurology. 2005 Oct 25;65(8):1165-8. Should the Babinski sign be part of the routine neurologic examination? PMID: 16247040. [http://www.neurology.org/content/65/8/1165.long](http://www.neurology.org/content/65/8/1165.long))


Ditunno JF, BellR. The Babinski sign: 100 years on. BMJ 1996;313:1029-30. (26 October.)


Landau WM, Clare MH. The plantar reflex in man, w/special reference to some conditions where the extensor response is unexpectedly absent. Brain 1956; 79: 529–556.

Variations

(REF: http://www.ncbi.nlm.nih.gov/books/NBK27187/)

Chaddock: stroking the lateral malleolus
Gordon: squeezing the calf muscle
Oppenheim: applying pressure to the medial side of the tibia
Bing: multiple pinpricks on the dorsum of the foot
Cornell: scratching along the inner side of the extensor hallucis longus tendon
Gonda: flexing and suddenly releasing the 4th toe
Moniz sign – forceful passive plantar flexion of the ankle
Schaeffer: squeezing the Achilles tendon
Stransky: vigorously abducting and suddenly releasing the little toe
Strümpell: patient attempts to flex the knee against resistance
Throckmorton's reflex – percussion over the metatarsophalangeal joint of the big toe
(REF: http://en.wikipedia.org/wiki/Plantar_reflex)

Hoffmann's Sign

(REF: http://www.ncbi.nlm.nih.gov/books/NBK27187/)

Other Pathologic Reflexes

Suck: touch/stroke lips -> sucking movt
Snout: tap upper lip -> lip pucker/protrusion
Rooting, Snouting, absent, inhibits glabellar reflex
Grasp: stroke palmar or plantar (medially) -> continued grasp (contra SMA lesion)


Gait
Standard, toe, heel, tandem

Driving Evaluations

(REF: http://www.mass.gov/rmv/medical/policies/lossofco.pdf)
(REF: http://www.mass.gov/rmv/medical/policies.htm)
(REF: http://www.mass.gov/rmv/seniors/physicians.htm)
(REF: Driving and Neurologic Disorders. http://www.neurology.org/content/76/7_Supplement_2/S44.full)

Functional Signs

(REF: http://www.neurosymptoms.org/)

Weakness

Inconsistency (esp depending on distraction)

Hoover’s Sign

Hip extension (ipsi): When ask to press down w/“weak” heel, no downward pressure.

Hip flexion (contra): When ask to lift up “strong” leg, yes downward pressure on “weak” heel.

Hip flexion (ipsi): When asked to lift up “weak” leg, no downward pressure on “strong” heel.

Caveats: Splinting 2/2 pain, Neglect


Hip abductor sign

Can not abduct “weak” leg independently, but abducts on testing of both legs.

Giveway Weakness

Ask for maximal effort on count of 3. May be greater than typical confrontation testing

Gradually increase pressure on tested limb while distracting pt. May provide full force

Controlled raising can be more difficult, but displayed more by pts w/psychogenic symptoms

Arm-drop.

Caveats: May be found in stroke pts. Arm-drop may be mean to perform.


SCM testing

Rarely weak in disease, but may be present in psychogenic symptoms

Sensory

Change position

Move limbs in space to change perception of movt or sensation, such as wrapping fingers (REF: David Pilgrim)

Splitting midline
Caveat: Possible w/thalamic lesions.

Vibration over single bone

Common to test frontal bone/forehead or sternum

Caveat: common in patients w/disease

Asking pt to say “Yes” for touch, “No” for none

Caveat: May say “No” to indicate a weaker touch

Vision

Tunnel Vision

The area affected stays does map onto a visual angle. Eg, as pt moves back from an object, just the object is still perceived, instead of an enlarging area of visual space


Caveat: Cortical blindness

Hearing

Startle Testing

Movement Disorders

Characteristics

Rapid onset

Variable: frequency, amplitude, or distribution. Caveat: all movement disorders worsen w/stress

Improvement w/distraction, Worsening w/attention

Non-progressive w/frequent remissions

Absence of finger, tongue or face tremor

Coactivation of antagonistic muscles

(REF: PMID: 22166419)

(REF: PMID: 21956485)

(REF: PMID: 21626561)

(REF: PMID: 19555832)

(REF: PMID: 19542886)

Tremor

Entrainment: of affected limb when moving unaffected limb (or vice-versa)

“A tapping frequency of 3 Hz may be more discriminant, and produce more variation, than a faster 5 Hz rate.”

Load: tremor amplitude may increase with increasing load

Dystonia

Goes away w/anesthesia, suggestion, or placebo

High proportion had previous injury in the affected limb
Gait

Wildly swaying gait and balance problems w/out falling


Dizziness

Dysarthria

Stutter

Slowness

Word finding difficulty

Dysphonia

Dysphagia

Globus pharyngis or functional dysphagia

Discussing w/the pt

Hypnosis or suggestibility? May not be accurate, may be unethical.

Direct explanation may work better.