The 7 minute Neuro Exam

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Clinical Diagnosis in Neurology

1. Recognition of impaired function (compare to normal)
   - History and neurologic exam

2. Localization
   - Identification of what site of the nervous system has been affected based on neuroanatomy, neurophysiology

3. Etiology: consider most likely cause
   - Differential diagnostic list

4. Diagnostic procedures
   - Determine etiology (MRI, CT, EMG, Labs, LP Positional testing, MMT, ROM, neuro exam)

Abnormal Neurologic findings

- Abnormal behavior
- Impaired posture
- Impaired gait
- Impaired coordination
- Impaired reflexes
- Impaired movement of face/extremities
- Sensory disturbances (pain, paresthesia, anesthesia)
Clinical Diagnosis and Lesion localization

- Is the dysfunction real?
- What is the extent of the dysfunction pathology?
- Is the dysfunction Neurologic?


The 7 minute neurologic exam!

- Medical History
  - Chart review
  - Interview
- Physical Exam
  - Systems screening (vitals, skin assessment etc)
  - ROM
  - Strength
  - Sensation (protective?)
  - Coordination/Tone
  - Ocular Motor Exam

The 7 minute neurologic exam!

- Functional Exam
  - Balance
  - Gait
  - Mobility (transfers, bed mobility)
- Special tests per diagnosis
  - Dynamic Gait Index, Berg Balance, Functional Reach, 10M walk test, 5 times sit to stand, Pull test, Ice pack test etc
- PT Diagnosis
  - Problem list!
The 7 minute neurologic exam

- **Medical History** – Chart review
  - Past medical history – BPPV – TBI – Infectious
  - Medications (changes?) – Ototoxic – Chemo – Psych
  - Social history/Occupation – Physical – Computer

- **History of symptoms** – interview (90% of Dx!)
  - Description of symptoms
  - Onset – sudden vs. slow duration
  - Frequency
  - Time of day
  - Position changes or precipitating causes
  - Change in symptoms since onset
  - Associated pain/Headache/Location/Pattern
  - Recent illness/infection/cold sores/ticks?

The 7 minute neurologic exam

- **Physical Exam**
  - **Systems screening**
    - Cognition/Communication
    - Learning style/emotional status
    - Pain
    - Cardiopulmonary – Vitals – OH??
    - Musculoskeletal
    - Neuromuscular
    - Integument – Skin assessment
  - **Posture**
    - ROM – VBI Screen!

VBI screening

- ! First, clear cervical spine ROM
- Supine screening may aggravate motion provoked symptoms, so a seated VBI screening is used:
  1. Lean forward (forearms on knees),
  2. Extend head and rotate 45 degrees to 1 side.
  3. Hold 30 seconds (make sure is stable, not moving in end–position to rule out motion provoked symptoms)
  4. Assess symptoms / signs
  5. Repeat test with rotation to opposite side.

- Is it worth testing? **YES**  **NO**
Vertebral–Basilar Insufficiency (VBI)
Central lesion – Urgent Referral
› Most common symptoms:
   • Unilateral occipital headache, vertigo & nausea, vomiting, “lightheaded”
› Other signs of possible VBI:
   • Brainstem / Cerebellar signs
     • Abnormal nystagmus (horizontal in room light)
     • Ataxia
     • Paresthesias in limbs (unilateral or bilateral)
     • Dysphagia; Dysarthria,
     • Hyperreflexia – DTR, clonus
     • Abnormal reflex – + Babinski
     • Syndromes (eg, Horner syndrome)

The 7 minute neurologic exam
› ROM/Coordination/Tone
   • Rapid alternating movements
   • Pronator drift
     • Dynamic
     • Static
   • Finger to nose ∗
   • Heel to shin
   • Clonus
   • Babinski
   • Cogwheeling/rigidity (Modified Ashworth Scale follow-up if positive)

The 7 minute neurologic exam
› Strength
   • Motor system:
     • UE: deltoids, biceps, triceps, wrist extensors, hand interossei, wrist clonus
     • LE: hip flexors, rotators, quads, hamstrings, dorsiflexion, ankle clonus, Babinski
     • CN II–XII: Facial: eyebrow lift, wrinkle nose
       • eyes closed, smile, purse, frown, Say “Ahhh”, stick out tongue, shrug shoulders.
   • Sensation (protective?)
     • Facial CN V– V₁, V₂, V₃
     • Patterns (stocking/glove/shawl, dermatome/myotome/screening)
     • 10 gm monofilament
Practice the Motor exam.....

The 7 minute neurologic exam

Ocular motor exam (room light)
- Nystagmus (spontaneous?)
- Extraocular movements
- Visual fields
- Smooth pursuit (slow)
- Saccades (targets, fast)
- Trophia (cover–uncover)
- Phoria (cover–cross cover)
- Vergence (cross eyed)
- VORc

Observe for nystagmus –
- eyes at rest (spontaneous in midline)
- With gaze deviation of 30 degrees in each direction (to look for gaze-evoked nystagmus, avoid last 20 degrees of end range).
- Under 2 conditions:
  - a) In room light
  - b) With Frenzel lenses or IR Video goggles (visual fixation blocked)
Eye Movements

Eye movements serve two main visual functions:

**Gaze-holding movements**
- Visual fixation — center position
- Fixation in eccentric gaze
- Vestibulo-ocular reflexes

**Gaze-shifting movements**
- Smooth Pursuit
- Saccades
- Vergence

Check-list for Eye Movement Exam
**Preliminaries/Gaze-Holding Movements**
- **Preliminaries**: Visual acuity, fields, pupils (equal/reactive), lids (ptosis), head posture (tilt)
- **Ocular alignment** — cover–uncover test, cover–cross–cover test
- **Range of movement** — each eye
  - both eyes (note: upward decreases in the elderly)
- **Fixation in center position**
  - Look for saccadic intrusions and oscillations — Look for nystagmus
- **Fixation in eccentric gaze positions** (lateral, up and down) — Look for gaze-evoked nystagmus/rebound nystagmus
Spontaneous nystagmus in room light

- **Tonic (baseline) firing rate**
- With tonic asymmetry, may see nystagmus at rest
- Unilateral peripheral vestibular lesion ➔ Asymmetric at rest
  - Ex: left peripheral vestibular hypofunction
    - right side interpreted as though excited
    - subject experiences illusion rotation (vertigo).
  - Left horizontal canal hyo dysfunction
    - Eyes drift left ➔ snap back right (right-beating nystagmus)
Check-list for Eye Movement Exam
Preliminaries/Head posture–Tilt

- No Head tilt, No OTR–bilateral gaze evoked nystagmus–supratentorial lesions
  - Parietoinsular vestibular cortex (PIVC)
- Head tilt left, Left skew, OTR
  - Upper brainstem–jejunalis nucleus of Cajal (iNCJ) and medial longitudinal fasciculus (MLF) pontomesenteric–contraversive
- Head tilt left, Subjective visual vertical (SVV), OTR
  - Peripheral vestibular lesion

Check list for eye movement exams preliminaries–Gaze holding movements

- Cover–uncover
- Cover–cross cover
- Skew deviation

https://www.google.com/search?q=ophthobook+tropias+and+phorias&oq=tropia+and+phorias&aqs=chrome.3.69i57j0l3.17265j0j7&sourceid=chrome&ie=UTF-8

Disorders of Central Fixation

- Irrepressible saccades
  - Square wave jerks–can occur in normal, increased in cerebellar disorders, Huntington’s
- Saccadic intrusions
  - parkinsonian disorders, especially PSP, MSA; Friedreich’s Ataxia
- Saccadic oscillations
  - Eyes oscillate across midline, stop after each movement–cerebellar disorders
- Nystagmus
  - Downbeat nystagmus occurs in cerebellar degenerations and may be an induced feature of MSA
**Difficulty suppressing saccades:**
The Antisaccade Test = VORc

- Abnormal Responses:
  - Frontal lobe destructive lesions (contralateral targets)
  - Frontotemporal dementia
  - Dementia with Lewy bodies
  - PSP
  - Alzheimer disease

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**Gaze–Shifting: Smooth Pursuit**

- Eccentric gaze–
  - Use a point, not a surface
  - Slowly (conscious control), < 2 hz, 60°/sec
  - Avoid last 20 degrees of end range
  - Hold at end ranges to see nystagmus
  - H or Z-Box pattern
  - Look for speed, gaze evoked

- Eye–head pursuit: VOR–c
  - Look for catch-up saccades, nystagmus

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**Disorders of Gaze–Shifting: Smooth Pursuit**

- Smooth pursuit is susceptible to lesions at many sites
- Decreases with aging (1 undershoot normal > 65 y/o)
- Decreases with CNS drugs
- Impaired in cerebellar diseases
- Corrective saccades during horizontal pursuit = PSP, cerebellar diseases
- Horizontal square–wave jerks during vertical pursuit = PSP
Gaze Shifting: Saccades

- Saccades between two stationary visual targets, separated horizontally, vertically,
- Targets 8 inches apart, note:
  - Speed - slow, fast?
  - Accuracy - undershoot - overshoot
  - Direction (trajectory) - pulled upward or downward
  - Ease of initiation - delay
  - Saccades to command, “Look right, look left”

Saccades are generated in the brainstem reticular formation by burst neurons

- Disorders of speed
  - Slow horizontal = SCA2, slow vertical = PSP
- Disorders of accuracy = cerebellar lesions
  - Hyper metric = Fastigial nucleus, Hypo metric = dorsal vermis
- Disorders of trajectory
  - Abnormal vertical = Niemann Pick type C disease
- Disorders of initiation
  - Slow = Corticobasal syndrome
  - Hypo metric = Parkinson’s disease
### Gaze Shifting–Vergence

- Brainstem supra-ocular motor region control
- Normal 2–4 cm before diplopia
- Vergence driven by combined disparity and blur cues.
- Natural behavior is combined saccade–vergence movement
- Vergence driven by blur cues (accommodation)
- the eye under cover cannot see the targets
- Vergence driven by disparity cues: the prism displaces the retinal location of the image in one eye

### Gaze Shifting–Vergence

- Absent convergence or impaired vertical saccades in PSP
- Abnormal convergence with upward saccades=Posterior commissure lesions, pineal tumors
- Decreased convergence with Parkinson’s disease

### Resources:

- Michael Strupp MD
  - [https://www.youtube.com/watch?v=meXAJVoQdCI](https://www.youtube.com/watch?v=meXAJVoQdCI)
- Herman Kingma PhD
  - [https://www.youtube.com/watch?v=yB850dII CIY](https://www.youtube.com/watch?v=yB850dII CIY)
The 7 minute neurologic exam

- Ocular motor exam (room light)
  - Head thrust test
  - VOR, VOR cancellation (VORc)
  - Dynamic Visual Acuity (DVA)—eye chart
  - (Tragal pressure—IF ear pops, with Sx)
  - (Hyperventilation—IF MS suspected)

Schubert M et al, Phys Ther 84:2 Feb 2004

Clinical Tests of VOR function

- Head Impulse Test (HIT)
- Halmagyi Head Thrust test (HHIT)
- Dynamic Visual Acuity (DVA)
- Horizontal Head Shake (HHS)

HINTS to Diagnose Stroke in the Acute Vestibular Syndrome

- Three-Step Bedside Oculomotor Examination More Sensitive Than Early MRI Diffusion-Weighted Imaging.
- Head Impulse (Thrust) test
- Direction changing gaze evoked Nystagmus
- Test of Skew deviation on cover/uncover test

Practice the Ocular Motor exam...

The 7 minute neurologic exam

Balance Testing
Sensory Organization Test
  - Romberg
  - Tandem Romberg
  - Single leg stance
  Compare
  - Eyes open
  - Eyes closed

The 7 minute neurologic exam

- Mobility
  - Transfers
  - bed mobility
- Gait
  - Observational gait analysis
  - 10 M walk test
  - Dynamic Gait Index
The 7 minute neurologic exam

- Special tests per diagnosis
  - Tinetti
  - Berg Balance,
  - Functional Reach,
  - 6 min walk test,
  - 5 times sit to stand,
  - Pull test,
  - Ice pack test etc

Summary:
The 7 minute neurologic exam!

- Goals
  - Measureable
  - Patient centered (Motivational interviewing!)
- Plan of Care
  - Frequency
  - Duration of PT
  - Long term maintenance
  - Documentation...Ugggg.

Case example: PD

- Medical record review:
  - JV is a 83 y/o right handed Caucasian male from La Crosse, retired farmer with Parkinson’s disease. He stood up from a graduation lunch, 6/9/12, walked to the parking lot and fell backwards, sustaining a non-displaced occipital skull fracture, occipital SAH, left frontal SDH. Brief LOC and retrograde amnesia. He experienced brief dizziness, nausea, sweating and blurred vision. He was unable to ambulate without assistance, went by ambulance to ED. He has continued to fall 1x/wk. Ongoing lightheadedness with sit to stand. He has a 4 wheeled walker, which he does not think that he needs.
  - PMH: a-fib, cataract, low vision, DM, hypokalemia, HTN, hypercholesterolemia, systolic CHF, acute on chronic, LBP, REM sleep disorder, AAA, OSA, CTS, gout, Parkinson’s disease.
Case example: PD

- **PSH:** CABGx5 1991, Coronary stents x2 1995
- **Meds:** Sinemet, Florinef, albuterol, allopurinol, clonazepam, fluoxetine, furosemide, nitroquick, K-Dur, pravastatin, ranitidine. LAST Sinemet 30 min ago ("ON" meds)
- **Social hx:** Retired farmer, lives with his wife (who also has PD), 1 step entry into home, no handrail, 1 flight inside with handrail.
- **Systems review:**
  - Cognition: A, O x 3, follows 2 step commands
  - Pain: 2/10 head, 4/10 back
  - Cardiopulmonary: RRR, Vitals: 102/50, 76bpm sitting, 67/40, 79 bpm standing

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Case example PD

- **Systems review:**
  - **Integument:** healed 6 cm occipital laceration
  - **Musculoskeletal:**
    - ROM: 45 degree AROM of c-spine, 20 degree anterocollis, upper thoracic kyphosis.
    - B UE: WNL
    - B LE: SLR 60 degrees, df 0 degrees with knee extended
  - Strength: 5/5 all extremities
  - VB artery screen negative bilaterally

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Case example PD

- **Neuromuscular:**
  - **Coordination:** bradykinesia, resting and intention tremor, mild impaired RAM all extremities, R>L. No cogwheeling, no pronator drift, no limb ataxia, no clonus, negative Babinski bilaterally
  - **Balance Test:** Romberg positive, falls backwards 5 sec eyes open
  - **Mobility:** Sit to stand on second attempt, with UE push-off from the chair
  - **Gait:** stooped posture, wide based shuffling gait pattern with festination, freezing with turns and at door ways, worse at the end of medication dose, difficulty with initiating steps.
  - **10 M walk test:** 22.5 sec, FR 7 inches, Pull test positive
Case example PD

- **Ocular Motor exam: Room light:** normal smooth pursuit and saccades, no spontaneous or gaze evoked nystagmus, bilateral exotropia to cover-uncover testing, No exophoria to cover-cross cover testing, no skew deviation, impaired convergence @12 cm, normal divergence,
- **VOR** 20/25 static and dynamic without glasses.
- Negative head thrust test bilaterally
- **Procedure: Positional testing**
  - IR video goggles; no spontaneous or gaze evoked nystagmus, negative Horizontal head shaking,
  - **Positive Hallpike test B, L>>R**

Case example PD

Case example PD

- **PT diagnosis:**
  - Parkinson's disease with significant orthostatic hypotension, bradykinesia, impaired transfers, posture, balance and gait, frequent falls, with a recent fall sustaining SAH, SDH, secondary bilateral BPPV, with poor medication compliance and assistive device compliance (pre-contemplative stage of motivation) which combines to further increase his risk of falls.
Case example PD

- **Problem list:**
  - Bilateral BPPV
  - Medication and assistive device compliance
  - Impaired Motivation
  - Orthostatic hypotension
  - Bradykinesia/ impaired RAM
  - Hamstring/heel cord tightness
  - Impaired posture
  - Impaired Gait
  - Impaired balance

Case example PD

- **Goals:** Patient will:
  - Prevent falls
  - Maintain post–treatment head precautions
  - Daily compliance with med schedule and use of assistive device
  - Daily performance of HEP for HS, HC stretching, balance and posture exercises
  - Sit to stand transfers on the first attempt
  - Increase hamstring/heel-cord length by 5 degrees
  - Improve gait speed to 10 sec 10 M walk test
  - Continue to live in own home, with assist from wife
  - Continue independent ADLs, IADLs

Case example PD

- **Plan of care:**
  - Out–patient Neurologic PT 2x/week for 8 weeks
  - Treatment of bilateral BPPV
  - neuromuscular re–ed for ROM, posture, mobility, transfers
  - gait training
  - Instruct in HEP
  - Refer to EXPAND!
Questions???

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