Objectives

Demonstrate a routine neurological exam

Discuss the role of Neuropsychological testing for the evaluation of dementia

Discuss the role of Neuropsychological testing for the evaluation of refractory epilepsy
“If you don’t have a diagnosis after you have taken the history, take the history again”
## Neurological Physical Exam

- Mental status
- Cranial Nerve
- Motor
- Reflexes
- Coordination
- Sensation
- Gait/Station
# Neurological Physical Exam: Mental Status

<table>
<thead>
<tr>
<th>KOKMEN Short test of mental status:</th>
<th>Folstein Mini-Mental State Exam:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation: /8</td>
<td>Orientation: /10</td>
</tr>
<tr>
<td>Attention: /7</td>
<td>Immediate Recall: /3</td>
</tr>
<tr>
<td>Learning: /4</td>
<td>Attention/Calculation: /5</td>
</tr>
<tr>
<td>Abstraction: /3</td>
<td>Serial 7s, WORLD</td>
</tr>
<tr>
<td>Calculation: /4</td>
<td>Recall: /3</td>
</tr>
<tr>
<td>Information: /4</td>
<td>Language: /9</td>
</tr>
<tr>
<td>Construction: /4</td>
<td>Naming watch/pencil</td>
</tr>
<tr>
<td>Recall: /4</td>
<td>Repetition</td>
</tr>
<tr>
<td><strong>TOTAL: /38</strong></td>
<td>3 stage command</td>
</tr>
<tr>
<td></td>
<td>Reading “close your eyes”</td>
</tr>
<tr>
<td></td>
<td>Writing - spontaneous sentence</td>
</tr>
<tr>
<td></td>
<td>Copying - intersecting pentagons</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL: /30</strong></td>
</tr>
</tbody>
</table>
# Neurological Physical Exam: Cranial Nerve

<table>
<thead>
<tr>
<th>cranial nerve</th>
<th>exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupils (II, III)</td>
<td>Facial Sensation (V)</td>
</tr>
<tr>
<td>Eye Movements (III, IV, VI)</td>
<td>Facial Strength (VII)</td>
</tr>
<tr>
<td>Visual fields</td>
<td>Hearing (VIII)</td>
</tr>
<tr>
<td>Visual Acuity</td>
<td>Palate (IX, X)</td>
</tr>
<tr>
<td>Funduscopic exam</td>
<td>SCM/Trapezius (XI)</td>
</tr>
<tr>
<td></td>
<td>Tongue (XII)</td>
</tr>
</tbody>
</table>
Neurological Physical Exam:

Motor

Strength

- 0 = no contraction
- 1 = visible muscle twitch but no movement of the joint
- 2 = weak contraction insufficient to overcome gravity
- 3 = weak contraction able to overcome gravity but no additional resistance
- 4 = weak contraction able to overcome some resistance but not full resistance
- 5 = normal; able to overcome full resistance

Tone

Bulk

Spontaneous movement
Neurological Physical Exam:
Coordination

Finger to nose
Heel to shin
Finger tapping
Rapid alternating movements
Neurological Physical Exam: Reflexes

Reflexes

<table>
<thead>
<tr>
<th>Reflexes</th>
<th>Grading:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biceps</td>
<td>0 = absent</td>
</tr>
<tr>
<td>Triceps</td>
<td>1 = reduced (hypoactive)</td>
</tr>
<tr>
<td>Brachioradialis</td>
<td>2 = normal</td>
</tr>
<tr>
<td>Patellar</td>
<td>3 = increased (hyperactive)</td>
</tr>
<tr>
<td>Achilles</td>
<td>4 = clonus</td>
</tr>
<tr>
<td>Plantar</td>
<td></td>
</tr>
</tbody>
</table>
Neurological Physical Exam: Sensation

**Primary modalities:**
- Light touch
- Pain/Temperature
- Vibration
- Proprioception
Neurological Physical Exam:
Gait

Straightway gait
Heels
Toes
Tandem
Romberg
Pull test
VOLUNTEER?
### DEMONSTRATION

<table>
<thead>
<tr>
<th>Mental status</th>
<th>Cranial Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Motor</td>
</tr>
<tr>
<td></td>
<td>Coordination</td>
</tr>
<tr>
<td></td>
<td>Reflexes</td>
</tr>
<tr>
<td></td>
<td>Sensation</td>
</tr>
<tr>
<td></td>
<td>Gait/Station</td>
</tr>
</tbody>
</table>
Case: OW is a 71 yo M

Previous law enforcement officer with 12 years of education.

He has a history of heavy alcohol use, which worsened after retirement.

Presented to clinic with a 5 year history of cognitive decline.
Case : OW

Can no longer use an ATM
Not oriented to time
Unable to manage finances
Drives but gets lost
Medications need to be managed by spouse
No bladder dysfunction/No gait abnormality
Dementia Evaluation

Mild Cognitive Impairment

Dementia Syndromes:

- Alzheimer Disease
- Dementia with Lewy Body
- Frontotemporal Dementia
- Vascular Dementia
- Parkinson Disease with Dementia
Thin section coronal T1 weighted images from a 61-year-old male with pathologically proven Dementia with Lewy bodies (A) and a 69-year-old male with Alzheimer disease (B). There is relative preservation of the medial temporal lobes and hippocampal structures in the DLB patient as compared with the AD patient.
2013 DSM 5: Major Neurocognitive Disorder

Impairment in > 1 cognitive domain:
- Learning and memory
- Language
- Executive function
- Complex attention
- Perceptual-motor function
- Social cognition

- Acquired and decline from baseline
- Interfere with independence and ADLs
- Insidious onset/progressive
- Not accounted for by another mental disorder
Dementia

- Problems with judgment
- Reduced interest in hobbies/activities
- Repeats questions, stories, or statements
- Trouble learning how to use a tool or appliance
- Forgetting the correct month or year
- Difficulty handling financial affairs (bill-paying, taxes)
- Difficulty remembering appointments
- Consistent problems with thinking and/or memory
Dementia Evaluations: AAN recommendations

- Screen for B12 deficiency and hypothyroidism
- Screen for depression
- No clear recommendation for: CMC, BMP, LFTs, RPR
- Genetic testing for AD (apolipoprotein E epsilon 4 allele) or other dementias is not routinely recommended
Dementia Evaluations

Routine CT
or MRI Brain

Consider:
PET scans
Lumbar puncture

Identify common reversible causes of dementia
American Academy of Neurology 2001 practice parameter:

Neuropsychological testing is useful in identifying patients with dementia, particularly in high risk patients (memory impairment)
OW : Physical Exam

On exam:
No tremor, rigidity, bradykinesia
Gait is normal

KOKMEN:
Orientation: 5/8
Attention: 5/7
Learning: 2/4
Calculation: 0/4
Information: 2/4
Recall: 0/4
Abstraction: 2/3
Construction: osteomyelitis, cannot write
16/34
Laboratory/Radiology Investigations

Normal B 12
Normal TSH
MRI Brain with diffuse atrophy
Neuropsychological testing
OW : MRI Scan
OW: Neuropsychological testing

- Memory, Orientation and Amnesia Test
- Wechsler Adult intelligence Scale-IV (portions)
- Repeatable Battery for the Assessment of Neuropsychological Status (Form A)
- Trail Making Test Parts A & B
- Boston Diagnostic Aphasia Exam
- Complex Ideational Material Test
- Clock Drawing Test
- Animal Naming Test
- Controlled Oral Word Association Test
- Aphasia Screening Test (portions)
- Test of Oral and Limb Apraxia
- ECog-Everyday Cognition Rating Scale-Caregiver Form
- Disability Assessment for Dementia-Caregiver Form
- Global Deterioration Scale
Neuropsychological findings

**Intellectual Functions:** WAIS estimated Full Scale IQ moderately impaired. High level verbal (i.e. abstract reasoning) and nonverbal (i.e. complex puzzle solving) intellectual processes moderately impaired.

**Attention:** Basic attention variable. Able to recite five digits forward and backward but could not maintain set when reciting the alphabet. Complex and divided attention impaired. Mental calculation impaired. Patient able to sustain attention and concentration only for brief periods of time.

**Memory:** Autobiographical memory impaired. List learning and prose recall severely impaired. Patient had a “nay saying” bias that artificially inflated recognition memory performance. Very poor verbal and nonverbal retrieval and learning processes. Significant encoding deficit.

**Constructional/Visuospatial:** Intact copying and drawing skill influenced minimally by tremor and right hand/wrist problems. Perceptual problem solving impaired. Clock drawing done with minor errors. RBANS judgment of line orientation generally preserved. Copy of RBANS complex figure grossly intact. No visual or spatial neglect. Apparent geographical/spatial disorientation.

**Sensorimotor:** Sensori-perceptual exam deferred. Upper extremity tremor. No anosmia reported but patient reported smelling odors that were not apparent to others (i.e. smoke and rotting). Motor exam deferred secondary to right wrist peripheral disturbances. No facial asymmetry observed. Oral and limb apraxia errors. Generally normal gait.

**Language:** Speech was fluent and comprehensible but adversely affected by word finding difficulties. Aphasia screening revealed spelling dyspraxia, dysnomia, dyscalculia and mild reading error. Confrontation naming impaired. Comprehension of complex ideational material severely impaired. Difficulty following verbal instructions.

**Executive:** Category/semantic fluency severely impaired. Phonemic fluency severely impaired. Mental processing speed impaired. Poor mental tracking and mental flexibility. Minimal insight. Significant trouble maintaining mental set and sometimes forgot what he was supposed to do during a task. No utilization behaviors observed.

**Social-Emotional:** No suicidal or homicidal ideation. Probable olfactory hallucinations of likely neurological origin (i.e. frontal atrophy). Sense of humor retained. Episodes of apparent paranoia/suspiciousness, again likely neurological origin.

**Basic and Instrumental ADLs:** Adequate maintenance of hygiene. No incontinence. Cannot reliably prepare own meals. Cannot locate and dial a phone number independently or write/convey a telephone message. Cannot independently manage medications, finances, or correspondence.
Frontotemporal Dementia vs Alzheimer Dementia with behavioral features
Summary

- History from the family and patient
- Physical exam and bedside mental status exam
- Neuropsychological testing
- Screening for B12 deficiency
- Screen for hypothyroidism
- Screening for depression
- Neuroimaging
Neuropsychology and Refractory Epilepsy
Epilepsy Evaluation

Most patients respond to their first 1-2 AEDs
Drug resistant epilepsy cases should be evaluated in a Comprehensive Epilepsy Center
Surgical procedures include complete resection of epileptogenic brain tissue
Ideal outcome is seizure freedom
Presurgical evaluation

- History and physical exam
- EEG (routine and inpatient video EEG)
- High resolution MRI scan
- Positron emission tomography (PET)
- Single photon emission computed tomography (SPECT)
- Neuropsychological testing
- Speech and language testing
JR

45 yo M with epilepsy since adolescence
Diagnosed with Type 1 DM at age 17
Tried multiple AEDs with poor seizure control
Admitted to Epilepsy Monitoring Unit
Seizures localized to right temporal lobe
MRI was non lesional
Favorable candidates:
MRI identified lesions
Concordant EEG
Neuropsychological testing

- Lateralize or localize functional abnormalities
- Counsel patient about memory outcome after surgery
- Establish a cognitive baseline to compare to postoperative exam
Wada

Determine speech dominant hemisphere
Assess risk of postoperative memory decline
Inject amobarbital into internal carotid artery
Allows for independent testing of each hemisphere
Serious adverse effects in < 1 % (stroke, dissection, bleeding, infection)
fMRI vs Wada

Will Wada be replaced by fMRI for language lateralization?

- Less invasive option
- Some patients cannot participate in fMRI (agitation, cognitive issues)
- At times fMRI does not provide conclusive information

Post surgical cognitive outcomes

- Risk to cognition
- Left temporal resection can impair verbal memory - cognition can decline for 2 years after surgery
- Right temporal resection can impair spatial memory and learning
- Higher presurgical baseline are at risk for more memory decline
- Children recovered lost cognition more quickly and completely than adults

- Older age is a risk factor

- Lower baseline IQ is a risk factor
Postoperative cognitive rehabilitation may be helpful after temporal lobectomy.
Visual field deficits may occur - superior quadrant

Depression, psychosocial difficulties can occur
Intracranial electrodes were placed
Course complicated by intracranial hemorrhage
Right amygdalohippocampectomy was performed
Postoperative course complicated by left hemiplegia
Seizures continued
Patient had severe mood issues
Memory deficits worsened
Required three anticonvulsants to control seizures
Depression - with stay in the Behavioral Health Unit for suicidal ideation
Misusing insulin - with admissions for hypoglycemia
Divorce and estranged from wife and children
Mother established guardianship
Established care with psychologist for regular sessions
Psychiatrist for medication management
Readmitted to EMU for adjustment of medications
Was able to discontinue some anticonvulsants
JR Now

Now seizure free
Restarting work
No longer needs guardianship
Smiles!
Epilepsy: Summary

- Drug resistant epilepsy should be referred to an comprehensive epilepsy center
- Resective surgery can lead to seizure freedom in some cases
- Goal is to identify and resect the epileptogenic zone
Summary

- Neuropsychological testing is an integral part of the Neurological evaluation
- Detailed testing helps in the evaluation of Dementia/Cognitive Impairment
- Neuropsychological testing helps in lateralizing language and risk to cognition after epilepsy surgery
Thank you

Questions/comments