Dementia Causes and Neuropsychological Evaluation of the Older Adult

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Purpose of Seminar

• To review common dementia types and provide case examples of different patterns on neuropsychological evaluation that are seen with different types of dementia

• To help professionals recognize symptoms of dementia and when neuropsychological evaluation might be helpful in evaluating and treating their clients
Dang!... Now where was I going?

Superman in his later years
What is Dementia?

• Dementia is a **clinical syndrome** characterized by
  – Impairment in memory and at least one other cognitive domain
    • DSM-IV: aphasia, apraxia, agnosia, executive dysfunction
    • Other domains: attention, visuospatial abilities
  – These impairments are sufficient to cause
    • Impaired social and occupational functioning
    • Decline from characteristic functioning
  – Impairments are etiologically related to a persisting medical condition.
  – Impairments are not related only to delirium.
Dementia is a Clinical Syndrome

- It describes a complex of symptoms.
- It does not specify etiology.
- There are multiple causes of dementia.
Causes of Dementia

- Alzheimer’s Disease: 60%
- Cerebrovascular Disease: 10%
- Lewy Body Dementia: 15%
- Other:
  - Frontotemporal dementia
  - Parkinson’s disease
  - Huntington’s disease
  - *Normal pressure hydrocephalus
  - *Substance-related disorders
  - *Depression
  - *Metabolic/toxic conditions
    - *(more treatable)
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Evaluation of Dementia

• Patient and/or family becomes concerned

• Physician consultation (family practitioner, internist, psychiatrist)
  – Blood tests (B-12, thiamine, thyroid function, folate, neurosyphilis, HIV)

• Consultation with neuropsychologist – is there evidence of neuropsychological decline? What is the pattern of that decline?

• Consultation with neurologist
  – Brain structural imaging
  – Brain dynamic imaging (PET scan)
  – EEG

• Diagnosis and treatment planning
Prevalence of Alzheimer’s Disease (AD)

(Evans, D.A., JAMA, 1989)
AD: Symptoms (Typical Late-onset)

• Everyday forgetfulness
  – Forgetting conversations, repeating questions
  – Losing belongings
  – Forgetting medications
  – Confusion when driving

• Neuropsychological deficits
  – Problems with naming, semantic fluency, mild executive dysfunction
  – Incomplete awareness of deficit
AD: No Obvious Cause

- No evidence of metabolic, nutritional deficiencies, substance abuse, etc.
- Minimal or no depression
- Normal brain structural imaging (some cortical atrophy)
- **BUT**, dynamic brain scanning with PET may be abnormal (temporoparietal hypoperfusion)
Neuropathology of AD

Normal

Alzheimer's

Neurofibrillary tangles

Amyloid plaques

Neuron
Mild to Moderate AD
Cognitive Continuum

Memory/cognition

Normal

Abnormal

Preclinical

Mild Cognitive Impairment

Dementia

Younger   Age   Older
Mild Cognitive Impairment (MCI)
(Petersen, R.C, 2003)

• Mild decline in memory/cognition

• No dementia (but memory is 1.5 SDs below age-appropriate norms)

• Social and occupational functioning are essentially normal.

• Medical evaluation does not reveal a potentially reversible cause for the cognitive decline.
MCI as a Prodrome for Dementia

- Alzheimer’s disease
- Cerebrovascular Disease
- Lewy Body Disease
- Frontotemporal Dementia
- MCI
MCI: Conversion

• About 25-40% of MCI patients will convert to AD within 3 years
Vascular Dementia (VaD)

- Related to changes in the blood vessels of the brain resulting in reduced blood flow.
  - Slowly progressive vs. sudden

- Neuropsychological and behavioral changes may be slowly progressive and difficult to differentiate from AD

- There is a significant overlap with AD (up to 20% of AD patients also have VaD)
VaD: Diagnostic Criteria (DSM-IV)

- Deficits in memory plus one or more other domains causing impairment in social or occupational functioning

- Focal neurological signs and symptoms (e.g., impaired reflexes, gait abnormalities) or lab evidence of cerebrovascular disease (e.g., MRI findings of lacunar infarcts or periventricular white matter disease)

- Deficits do not occur in course of delirium
VaD: Neuropsychological Symptoms

- **Memory dysfunction**
  - Especially short-term memory but also remote memory
  - Cuing is helpful

- **Executive dysfunction**
  - Difficulty with organization, problem-solving, decision-making

- **Mental slowing**

- **Distractibility**

- **Mild personality changes**: depression, irritability, apathy

- **Mild parkinsonian features**: gait and balance problems
VaD: Brain MRI Images

Vascular changes

‘3D’ view of brain from right

Slice 1

White matter abnormalities

Slice 2

No vascular changes

slice 1
slice 2
Lewy Body Dementia (LBD)

- Cause of 15-20% of dementia
- Onset between ages 50 and 85
- Rapid disease progression
Probable LBD: Diagnostic Features
(McKeith et al., 1996)

• Progressive cognitive decline interfering with social and occupational functioning

• At least two of the following:
  – Fluctuating cognition with variations in attention and alertness
  – Recurrent visual hallucinations that are typically well-formed and detailed
  – Spontaneous parkinsonian motor features
Behavioral Profile of LBD

• Neuropsychological deficits
  – Executive and attentional dysfunction (perseveration, poor digits backward)
  – Visuospatial deficits (judgment of line orientation)
  – Memory dysfunction (immediate memory > delayed memory); structure is helpful

• Apathetic, depressed

• Sleep problems?
  – Vivid dreams,
  – Thrashing
  – Rapid Eye Movement Behavior Disorder (REM-BD)
Parkinson’s Disease (PD)

• PD arises from depletion of dopamine in subcortical brain systems, initially the substantia nigra and the basal ganglia.

• Onset is typically between the ages of 50 to 65.

• Although movement abnormalities (tremor, stiffness, slowing) are most prominent, cognitive and emotional symptoms are common.
Cognitive Changes in PD

• Cognitive dysfunction occurs in up to 50% of patients.

• Dementia appears in up to 40% of patients
  – One study observed 80% of PD pts developed dementia within 8 years (Aarsland et al., 2003)
Neuropsychological Profile of PD

• “Frontal lobe syndrome”: deficits in executive function (initiation, problem-solving) and attention

• Visuospatial deficits - eye movements may be impaired.

• Weakness in immediate memory but delayed memory savings and recognition memory may be normal

• Patients are aware of (and may overestimate) neuropsychological deficits.
Emotional Features of PD

- Behavior/Affect
  - Depression is common (30 – 60%).
  - Anxiety is common (40%).
  - Non-threatening visual hallucinations may occur, especially in advanced disease or pts developing dementia.
Frontotemporal Dementia (FTD)

• Gradual and progressive changes in behavior
  – Pick’s disease
  – Frontotemporal lobar degeneration

• Gradual and progressive changes in language
  – Primary progressive aphasia
  – Semantic dementia
Features of FTD

- Prevalence between ages of 45 to 64 is 6.7 per 100,000
- Often diagnosed as AD but neuropathology and initial presentation differ
- Onset usually between ages 40 and 64
- Average duration = 8 years
- Genetic component: 40% have family history
Symptoms of Pick’s, FLD

• Inappropriate social behavior, lack of inhibition
  – Swearing
  – Lack of social tact
  – Lack of concern about appearance and hygiene
  – Impulsiveness, poor judgment

• Apathy
Depression

- Symptoms = apathy, sadness, vegetative symptoms, deficits in attention, mental speed, memory; variability in test performance

- Assessments = medical, psychiatric, neuropsychological evaluation
Normal Pressure Hydrocephalus (NPH)

– Symptoms = urinary incontinence, gait abnormality, forgetfulness

– Assessment = lumbar puncture

– Treatment = ventricular shunt
  • Delayed treatment may not relieve cognitive symptoms
Conclusions regarding Dementia types

• There are multiple causes of dementia.

• Different causes may be distinguished from one another.

• There is variation in the extent to which dementia is treatable, based on its likely cause and severity.

• Early detection, diagnosis and treatment of dementia are important:
  – To relieve symptoms.
  – To slow disease progression.
  – To improve quality of life, both for patients and caregivers.
How to Recognize Dementia in a Clinical Setting:

• Suspicion of dementia is raised during the interview:
  – Difficulty with learning and remembering new information (e.g. appointments, recent events)
  – Impaired reasoning and problem-solving ability at work or home
  – Problems with handling complex tasks or following a complex train of thought
  – Impaired spatial reasoning (e.g. finding way around familiar environment)
  – Word-finding difficulty
  – Changes in behavior (e.g. increased passivity or irritability, suspiciousness, depression)
How to Recognize Dementia in a Clinical Setting:

• Remember, patients and families usually complain about memory problems, even if their problems are related to other cognitive problems (e.g. attention, language, executive dysfunction).

• Remember, pay attention to the patient’s as well as the informant’s report of symptoms. Patients with certain type of dementia (e.g. Alzheimer’s disease) typically do not complain of cognitive problems. Caregivers are reporting the problems. With depression, patients often complain of cognitive changes.
What is Neuropsychology?

- “Clinical neuropsychology is an applied science concerned with the behavioral expression of brain dysfunction” (Lezak, 1995)
Purpose and Benefit of Neuropsychological Assessment

Assist with Diagnosis (e.g. normal aging vs. MCI, psychiatric vs. neurological symptoms)

Provides characterization of deficits based on objective data and avoids many sources of error inherent in subjective observational methods

Estimation of Functional Status
  - Capacity for self-care
  - Ability to return to work
  - Reliability in following a therapeutic regimen
  - Driving
  - Money Management
  - Appropriate living arrangement
  - Competency to make health care and financial decisions
Purposes and Benefits of Neuropsychological Assessment

- **Treatment Planning and Intervention:**
  - Provide description of patient’s mental capabilities.
  - Help caregivers understand nature of cognitive problems to develop compensatory strategies and reduce frustration.
  - Assess efficacy of intervention, measure the effects of surgical or medical procedures, measure medication effects.
  - Staging dementia severity and tracking dementia progression.
  - Capitalize on cognitive strengths and to accommodate weaknesses.
Illustrations of Some Neuropsychological Measures

Boston Naming Test
Word list learning task
Story memory
Digit Span
Clock Drawing Test
Trail Making Test
Delayed Recall---Words and Story
Verbal Fluency
What can you expect when you refer a patient for neuropsychological evaluation?

• 3-4 hours of evaluation
• Clinical interview with patient and collateral source
• Administration of standardized tests to the patient
• Scoring of test data and writing of report
• Feedback session with the patient and family member
• Sending report to referral source
• Reports include clinical information, standardized test results, diagnostic impressions, recommendations
Examples of Neuropsychological Tests Used to Assess for Cognitive Impairment in the Geriatric Population:

- Test selection is determined by referral question and the utility of a test to answer question
  - Global Cognition---
    • CERAD battery
    • Dementia Rating Scale-2
    • Repeatable Battery for the Assessment of Neuropsychological Status (RBANS)
  - Executive functions---
    • WAIS-IV Digit Span
    • WAIS-IV Similarities
    • Wisconsin Card Sorting Test
    • Trail Making Test
    • Controlled Oral Word Association Test
    • Clock Drawing Test
  - Memory---
    • California Verbal Learning Test-II
    • Wescher Memory Scale-IV subscales
Examples of Neuropsychological Tests:

- **Language---**
  - Boston Naming Test
  - Multilingual Aphasia Exam
  - Categorical Fluency (e.g. Fruits and Vegetables)

- **Visuospatial functions---**
  - Judgment of Line Orientation
  - WAIS-IV Block Design
  - WAIS-IV Matrix Reasoning

- **Emotional status---**
  - Geriatric Depression Scale
Case example of neuropsychological performance of patient with Alzheimer’s disease

Patient is 81 year old Caucasian male
Gradual decline in short-term memory functioning for 2 years.
Patient denied cognitive deficits.
No significant medical or psychiatric history.
Has a college degree in Mechanical Engineering.
• MMSE = 25/30, Dementia Rating Scale = 113/144
• Language---Boston Naming Test and Categorical Fluency = Mildly Impaired
• Visuospatial Functions---WNL on Judgment of Line Orientation, WAIS-III Block Design
Case example of neuropsychological performance of patient with Alzheimer’s disease

- **Memory**---Poor learning ability and flat learning curve; Delayed free recall = 0/10 words, recognition does not improve
- **Executive functions**---Reduced abstract reasoning abilities, reduced cognitive flexibility, mildly perseverative, reduced judgment and problem-solving
- **Emotional functioning**---Reduced interest in activities, social withdrawal, more irritable, perseveration on task of sorting junk mail all day
Case example of neuropsychological performance of patient with Vascular dementia

Patient is 74 year old Caucasian male
Decline in cognitive functioning for 3-4 years, worse after CVA and MI.
Medical history, including diabetes, HTN, high cholesterol.
MRI with findings of subcortical vascular disease, left occipital infarct.
College degree, high average premorbid functioning.
• MMSE = 23/30
• Language---Boston Naming Test = Mildly Impaired with phonemic cueing improving
• Visuospatial Functions---Unable to perform Judgment of Line Orientation, cannot copy complex visual figures
Case example of neuropsychological performance of patient with Vascular dementia (cont.):

- **Memory**—Low average learning ability; Delayed free recall = 2/10 words, recognition improves
- **Executive functions**—Reduced attentional abilities, mildly impaired verbal fluency (letter), impaired cognitive flexibility (Trails B), significant perseverative and intrusive behavior, impaired judgment and problem-solving. Slowed processing speed.
- **Emotional functioning**—Poor initiation, motivation, apathy
Case example of neuropsychological performance of patient with depression:

Patient is 84 year old Caucasian male
Sudden onset of apathy, depression, lack of drive, intense negativity.
Significant decline in adaptive functioning.
Some vascular risk factors, small vessel disease on MRI.
College degree, high average premorbid estimate.
• MMSE = 28/30
• Language---Boston Naming Test and Categorical Fluency = Average
• Visuospatial Functions---High Average = Judgment of Line Orientation & Block Design
Case example of neuropsychological performance of patient with depression (cont.)

- Memory---Inconsistent, variable but WNL. Adequate learning ability, delayed free recall = slightly reduced, recognition = high average
- Executive functions---Good complex attention, WNL processing speed, good abstract reasoning abilities, intact cognitive flexibility (Trails B), not perseverative, intact judgment and problem-solving, good verbal fluency
- Emotional functioning---Depression (GDS = 24/30, very severe)
References

