

An aerial photograph of a university campus, likely the University of Illinois at Chicago, with a semi-transparent purple overlay. The image shows various academic buildings, a large green lawn, and surrounding trees. The text is centered over the image.

TYPES OF DEMENTIA: It's not always Alzheimer's disease

Jennifer Arnold, MD, PhD
Assistant Professor of Neurology
Brain and Aging Conference 2025



SIU MEDICINE

DALE & DEBORAH SMITH CENTER
FOR ALZHEIMER'S RESEARCH
& TREATMENT

Goal and Talk Outline

Identify various types of dementia and the differences between them

Outline

- Initial diagnosis of cognitive impairment and dementia
- Reminder of Alzheimer's disease, vascular dementia, Lewy body dementia
- Discuss atypical dementias:
 - Frontotemporal dementia
 - Atypical forms of AD
 - Progressive supranuclear palsy and corticobasal syndrome
 - CTE
 - LATE

Disclosures

- Nothing relevant to disclose

Cognitive function

- Memory

- Working/immediate
- Short-term
- Long-term

- Executive function

- Planning
- Multitasking, multistep tasking
- Judgement, logic, making decisions
- Calculations, money management
- Abstraction
- Praxis

- Psychological

- Mood
- Anxiety
- Hallucinations, delusions

- Visuospatial

- Finding objects
- Depth perception
- Getting dressed appropriately
- Writing, reading
- Navigation
- Recognizing faces, objects


- Behavior

- Personality
- Social inhibition
- Empathy, sympathy
- Judgement

- Language

- Appropriate word usage
- Fluency
- Grammar
- Comprehension
- Reading, writing

What is dementia?

- Process causing (usually) progressive cognitive dysfunction
 - Greater than normal aging
 - Interferes with daily social or occupational function
 - Non-reversible process
-
- Mild Cognitive Impairment
 - *Subjective* complaints of cognitive difficulty
 - Abnormal cognitive function on testing (*objective findings*)
 - Daily function essentially preserved
 - Possible reversible 

Is it dementia?

- Medications
 - Benzos
 - Opioids
 - Hypnotics
 - Anticholinergics
 - Barbiturates
 - AEDs, muscle relaxers
 - Neuroleptics
- Other medical issues, deficiencies, toxicities
 - Vitamin deficiencies – B12, B1, folate
 - Endocrine dysfunction – thyroid
 - Chronic liver or kidney disease
 - Severe lung disease, CHF
 - Inflammatory/autoimmune disease
 - Infections
- Sleep disruption
 - OSA
 - Insomnia
- Depression, anxiety
- Other neurological causes
 - Longstanding MS
 - Epilepsy or seizures
 - TBI
 - Stroke
 - Tumors or other mass lesions
- Pain
- Hearing and/or vision loss

Workup for cognitive impairment

- History
- Screen for OSA
- Screen for depression, anxiety
- Physical exam
- Cognitive screening
 - MMSE
 - MoCA
 - SLUMs
 - Mini-Cog, ACE-R, others
- Basic labs
 - CBC
 - Metabolic panel
 - TSH
 - B12, others if risk
 - Infections if risk – RPR, HIV
- Imaging
 - CT
 - MRI

Types of neurodegenerative (primary) dementia

- Alzheimer's disease
 - Parkinson's disease dementia and dementia with Lewy bodies
 - Frontotemporal dementia
 - Chronic traumatic encephalopathy (CTE)
 - Progressive supranuclear palsy and corticobasal syndrome
 - Limbic-predominant age-related TDP-43 encephalopathy (LATE)
 - Others – Huntington's disease, prion disease (CJD)
-
- (Vascular dementia)

Why does it matter?

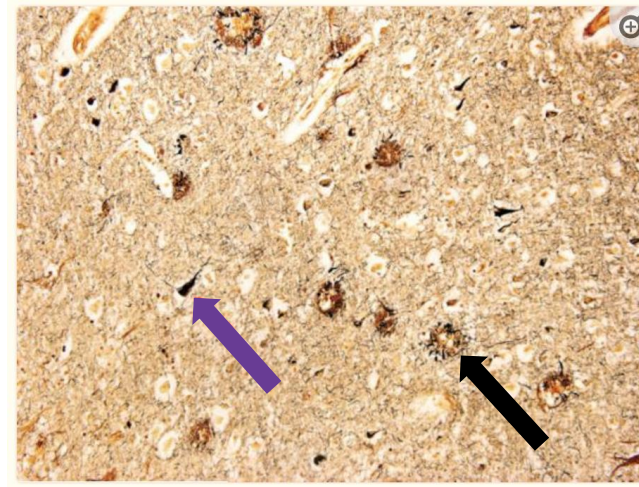
- Many patients will come in with reported “memory” problems
 - A lot of these are not truly memory – executive dysfunction, language, attention
- Comorbidities vary
- Risks and genetics vary
- Diagnostic clarity for patients and families
- Treatments vary

Comparing dementias

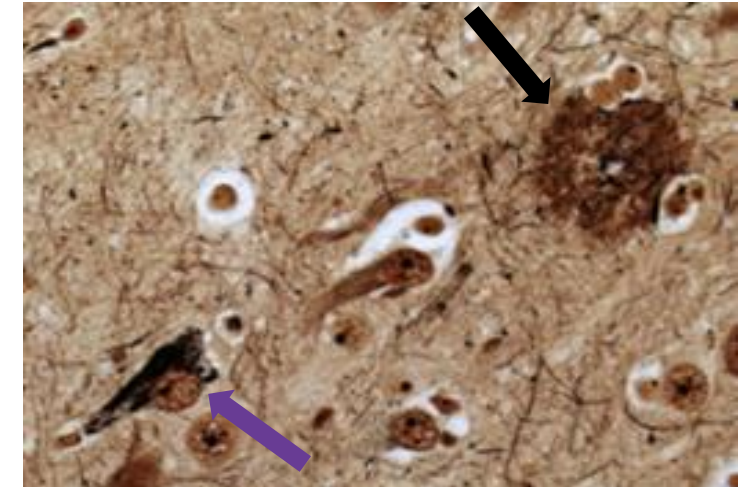
- Pathology
 - Amyloid-beta and 3R-tau
 - Alpha-synuclein
 - Tau species (4R)
 - TDP-43
- Demographics and symptoms
- Imaging and other diagnostic testing

Alzheimer's disease

- Most common cause of dementia in the US and in the world
- Estimated prevalence of 6.5 million people over age 65 living with AD in the United States
 - 1/9 people over 65
 - 73% of these people are over age 75
- Due to accumulation of **amyloid-beta plaques** & **neurofibrillary tangles** of p-tau



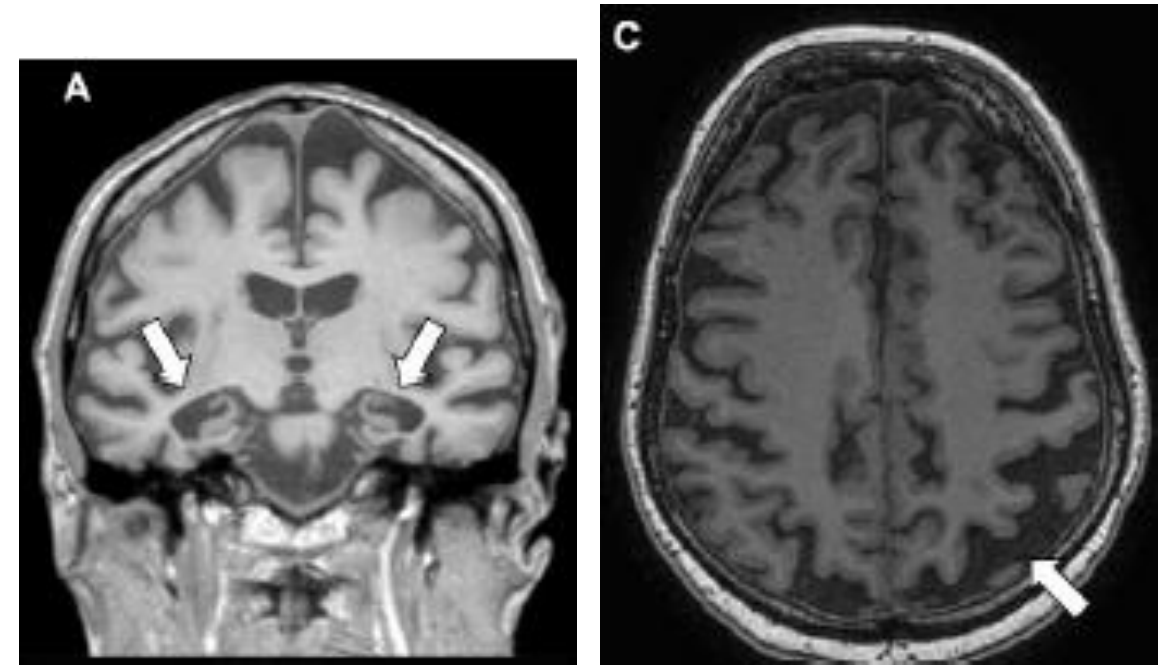
Perl D. *Mt Sinai J Med* 2010; 77:32



Keene CD et al. *UptoDate* 2023

Alzheimer's disease

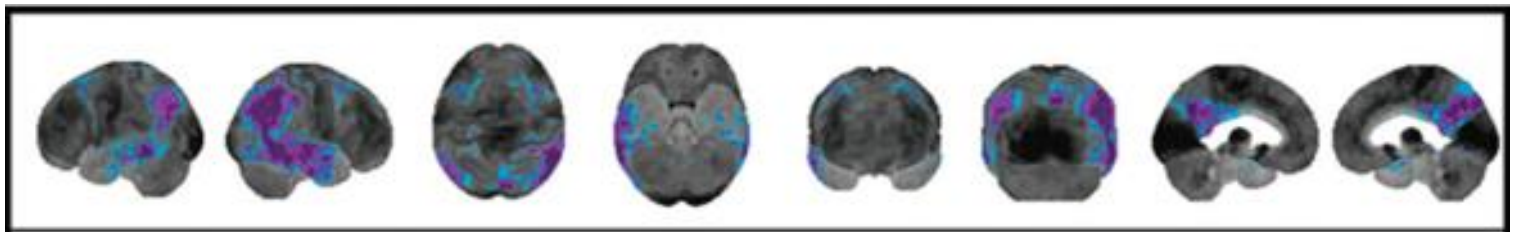
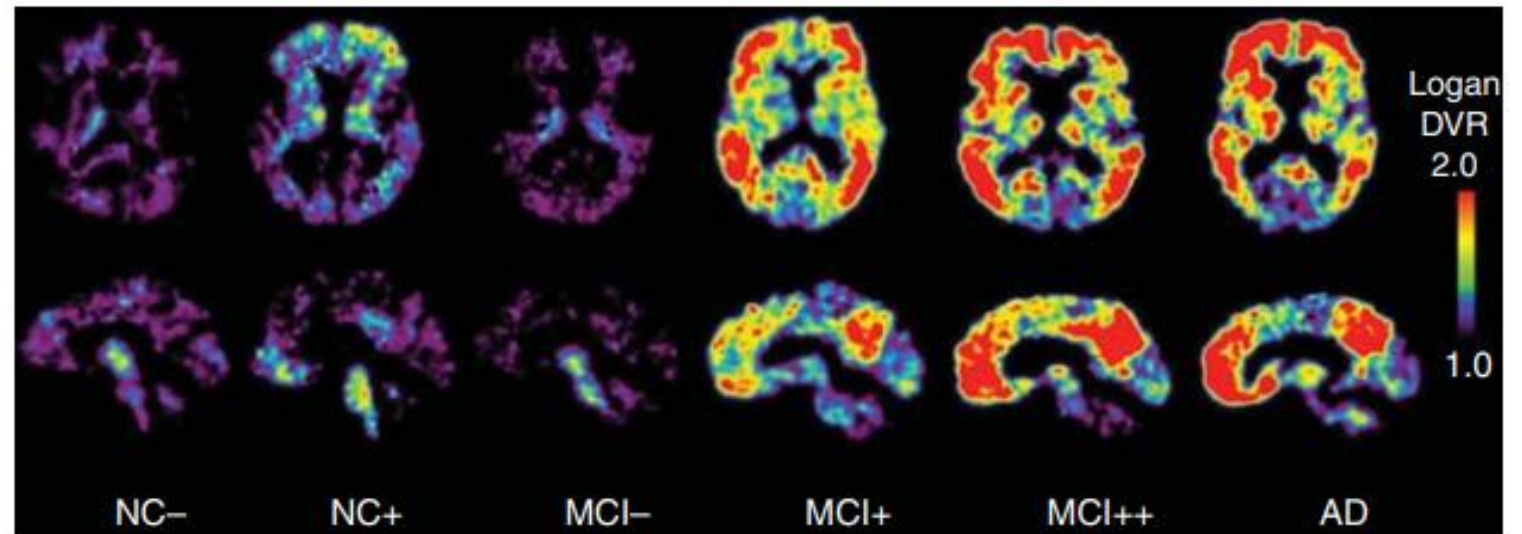
- Symptoms:
 - Short-term episodic memory loss
 - Executive dysfunction
 - Later: behavioral changes/agitation, delusions, worsening ADLs, wandering, single-word word-finding difficulties
- MRI/CT with atrophy especially mesial temporal and parietal



Radiology 2023;308:e230173

Alzheimer's disease

- CSF (and serum!) – levels of amyloid (Abeta40 and 42), total and p-tau
 - Ratios often used - P-tau/Abeta42 or Abeta42/40 ratios
- PET scan
 - Amyloid/tau shows accumulation of tracer
 - FDG-PET shows hypometabolism in parietal lobes



Vascular dementia

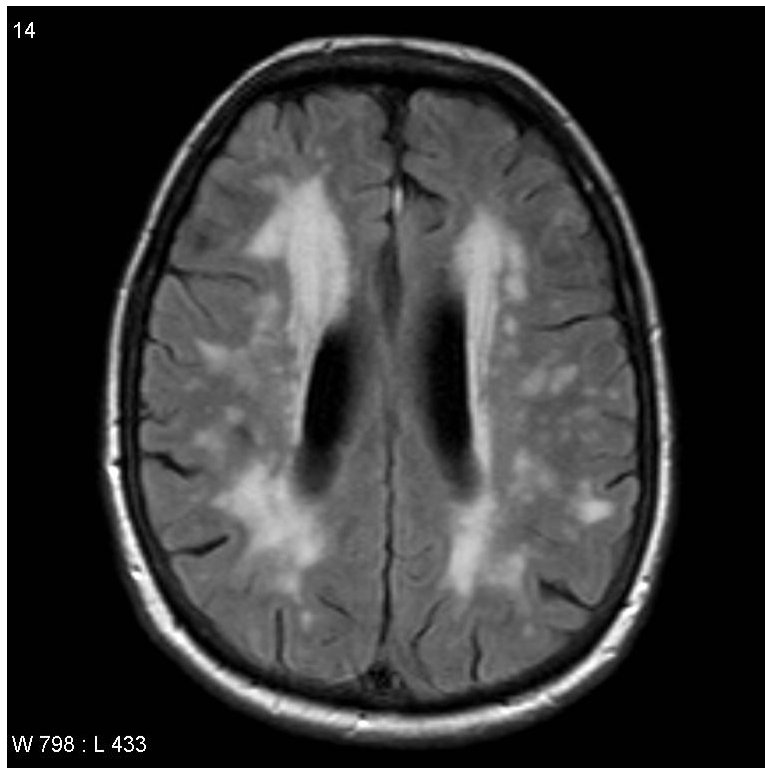
- Cognitive impairment due to vascular brain injury
 - Ischemic stroke, hemorrhage, microvascular disease
- Second most common dementia type – 15-20% of diagnosed patients
- Two main types:
 - Slowly progressive over time due to microvascular disease – “Binswanger’s disease”
 - Stepwise worsening of cognition due to new strokes over time – multi-infarct dementia
- Risk factors – cardiovascular
 - HTN
 - Hyperlipidemia
 - T2DM
 - Smoking
 - Atrial fibrillation
 - Coronary artery disease

Typical findings:

- Executive dysfunction
- Focal cognitive symptoms – language, praxis, visuospatial
- Non-cognitive focal findings

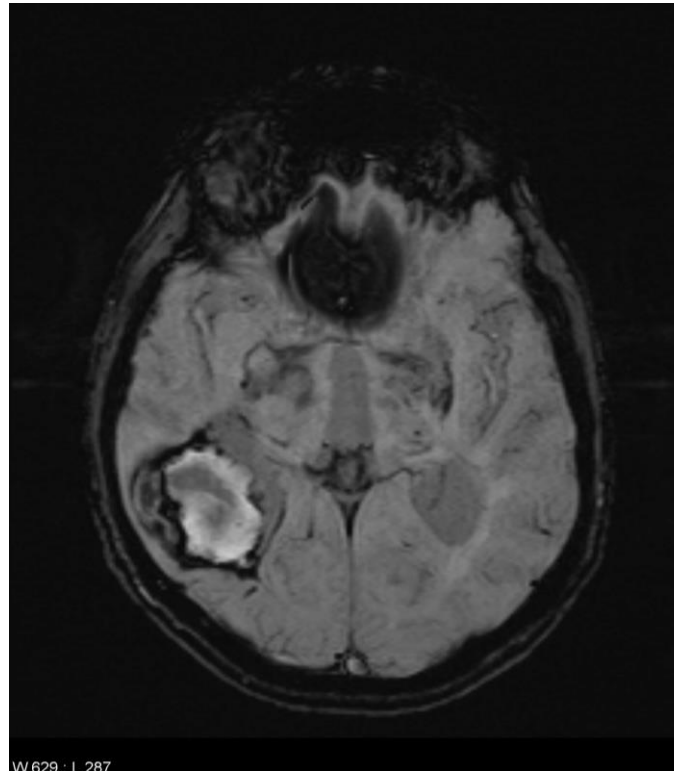
Vascular dementia

Microvascular disease



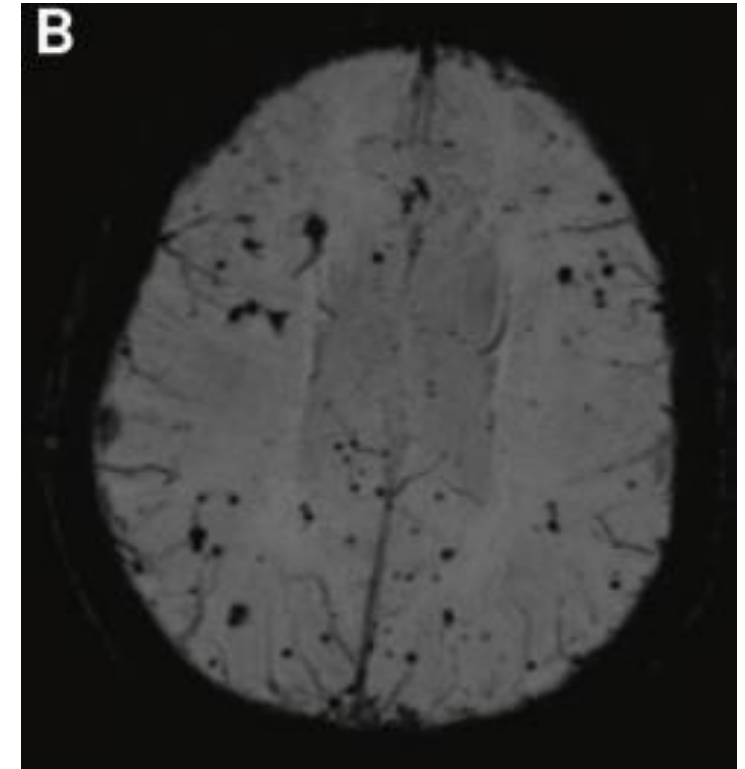
Case courtesy of Frank Gaillard,
Radiopaedia.org, rID: 10674

Intracerebral hemorrhage



Case courtesy of Charlie Chia-Tsong Hsu,
Radiopaedia.org, rID: 19872

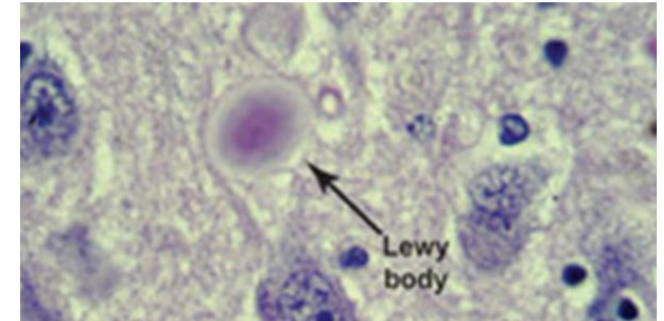
Microhemorrhages



Suppiah et al. *Diagnostics*
(*Basel*) 2019; 9:65

Dementia with Lewy bodies and Parkinson's disease dementia

- Due to accumulation of α -synuclein – Lewy bodies = Lewy body dementia (LBD)
- Exist on a spectrum relating to timing of symptoms



<https://www.alz.org>

Parkinson's
disease

Dementia with
Lewy bodies

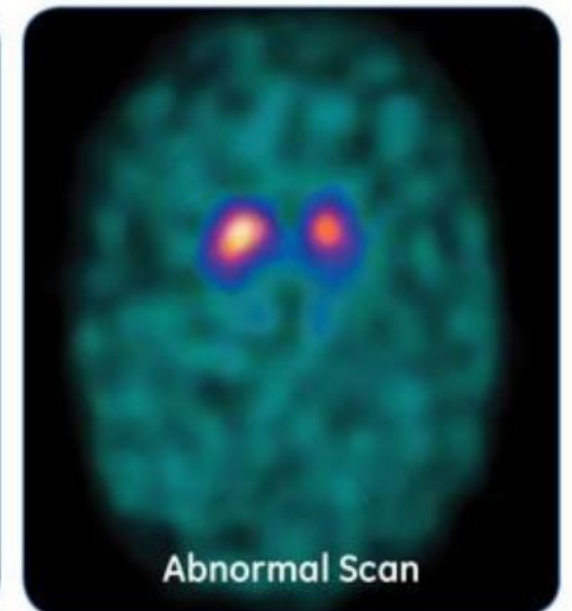
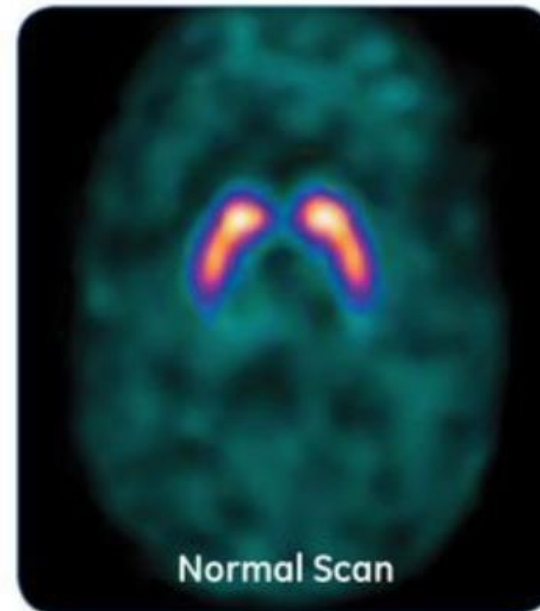


Lewy body dementia

- Cognitive impairment/dementia
 - Executive dysfunction
 - Trouble with attention
 - Bradyphrenia and slowed processing
 - Visuospatial difficulties
- Visual hallucinations
- Prominent fluctuations in cognition – esp in DLB
- REM behavior disorder
- Parkinsonism – bradykinesia, resting tremor, postural instability, rigidity

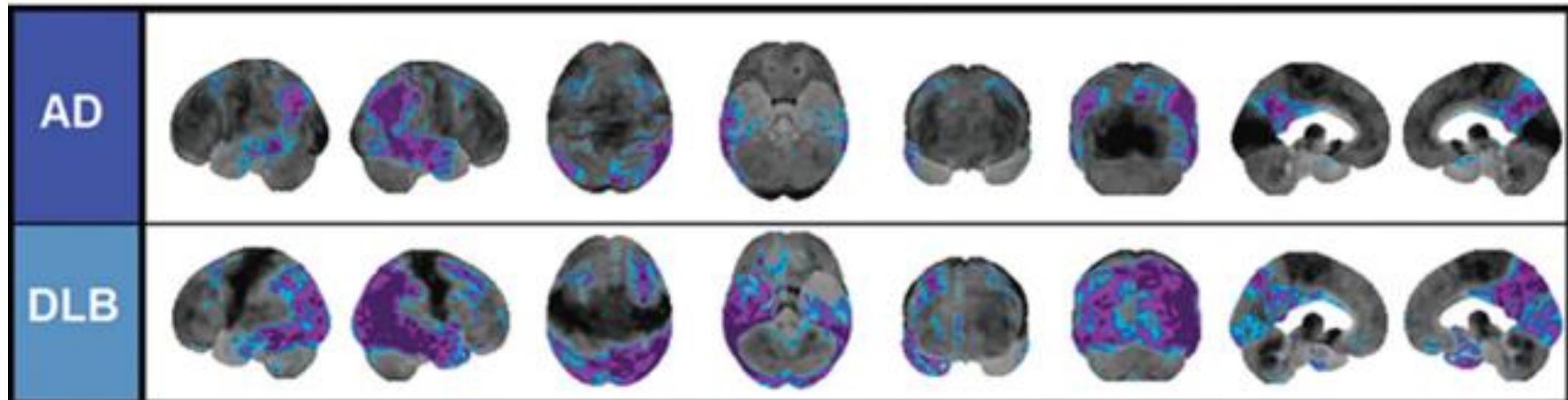
Lewy body dementia

- History and physical exam critical
- No biomarker scans... yet
- DaT scan positive especially if parkinsonism present
 - Not specific to dementia
 - Usually not needed
- Synuclein skin test
 - May help distinguish from AD
 - Not clearly specific to disease
 - Not covered by insurance?



Lewy body dementia

- MRI/CT with more diffuse atrophy in DLB, may be normal in PD
 - Sparing of medial temporal lobes
- FDG-PET – posterior hypometabolism



Atypical dementia

Frontotemporal dementia

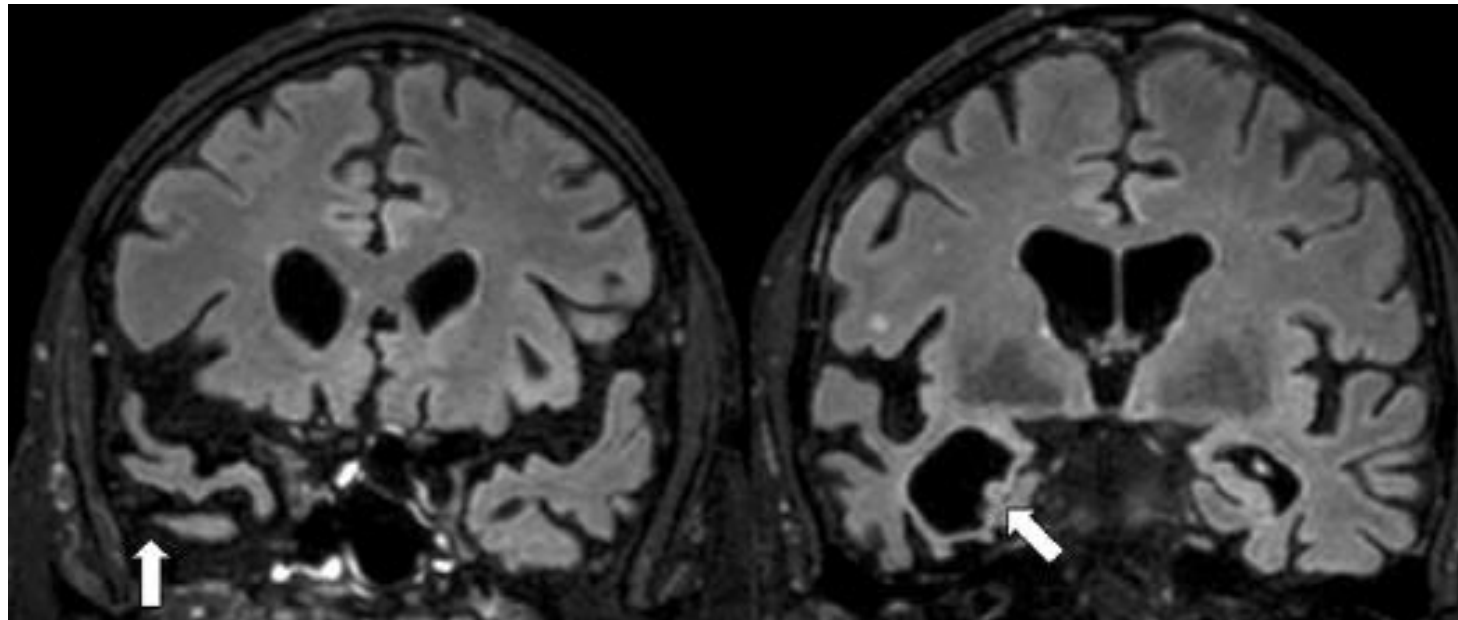
- Most common cause of *early onset dementia* – before age 65
- Multiple causative processes, leading to frontal and/or temporal lobe predominant degeneration
 - “tauopathies” – p-tau but different isoform than that in AD
 - TDP-43
 - “FET” – FUS, EWSR1, TAF15
- At least 20% (may be up to 40%) may be genetic, dominantly inherited
 - Mostly from *MAPT* (tau), *GRN* (progranulin), and *C9orf72* genes – at least 50% of familial FTD from these three genes

Frontotemporal dementia

- Three main subtypes
 - Behavioral variant frontotemporal dementia (bvFTD)
 - Semantic primary progressive aphasia (svFTD)
 - Nonfluent agrammatic primary progressive aphasia (nfvFTD)

Frontotemporal dementia

- CT/MRI – significant frontal and/or temporal atrophy



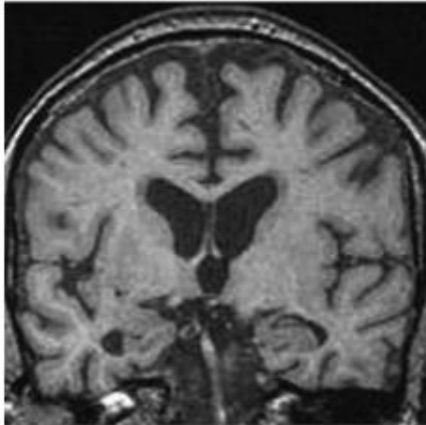
Frontotemporal dementia



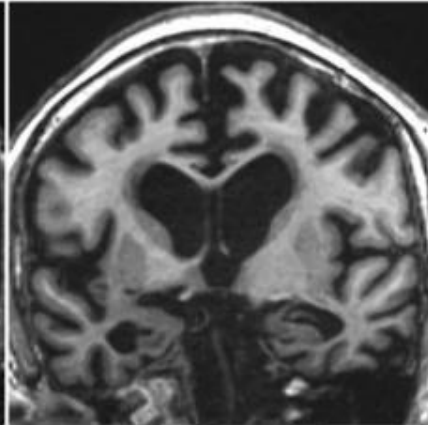
SIU MEDICINE

DALE & DEBORAH SMITH CENTER
FOR ALZHEIMER'S RESEARCH
& TREATMENT

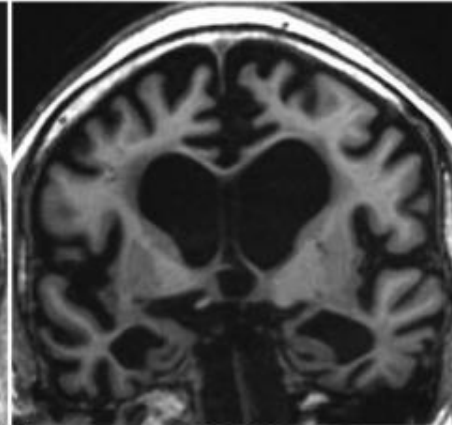
Age 58



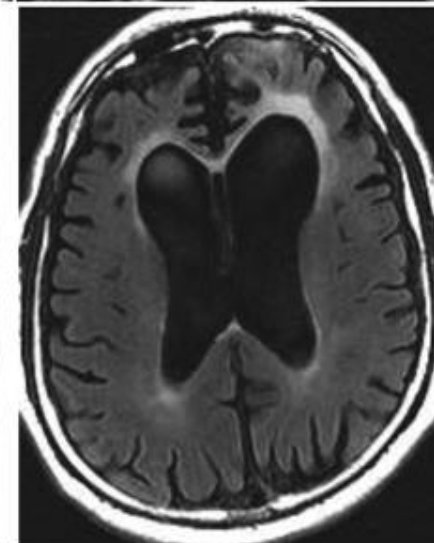
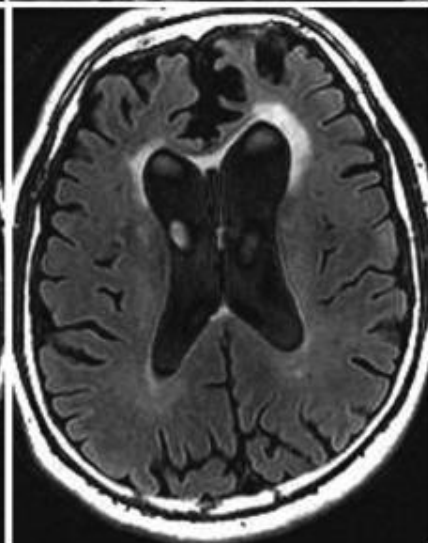
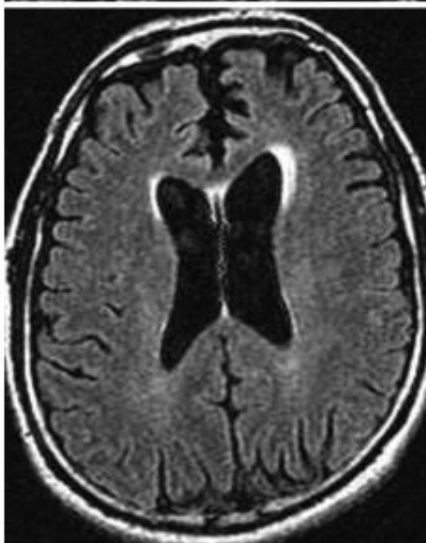
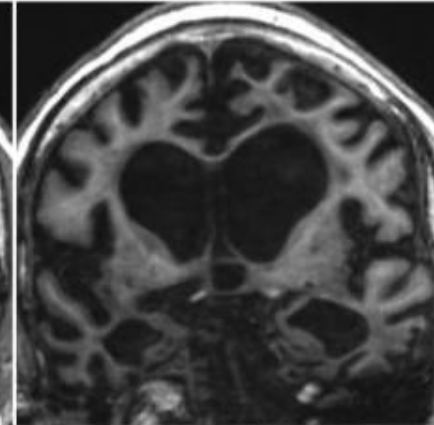
Age 61



Age 64

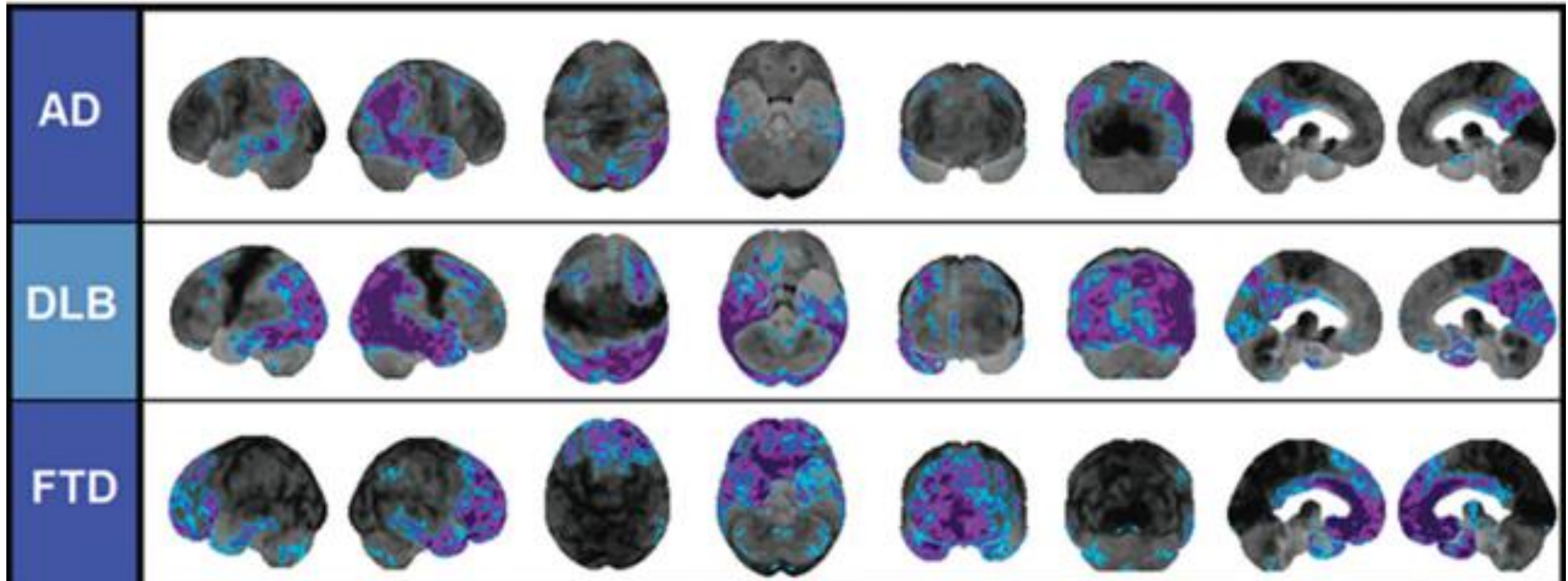


Age 66



From Boeve B. *Continuum* 2022; 28:702

Frontotemporal dementia



- Best use of FDG-PET is to distinguish AD from FTD in unclear cases
- Covered by Medicare for this purpose

Frontotemporal dementia

- No biomarker PET scans – tau-PET not useful, no ligands from other proteins
- No serum studies
 - May be able to eventually distinguish AD from FTD if amyloid or p-tau markers are found
- No CSF markers
 - Similar to serum, may be useful to distinguish AD biomarkers in patients with unclear diagnosis
- Neuropsychological testing may miss symptoms
 - Attention/concentration, executive function, language can also be affected in other neurodegenerative diseases and non-neurodegenerative diseases

Behavioral Variant FTD (bvFTD)

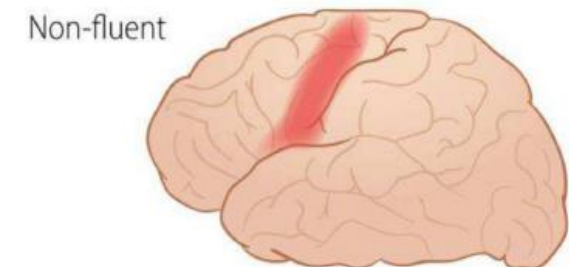
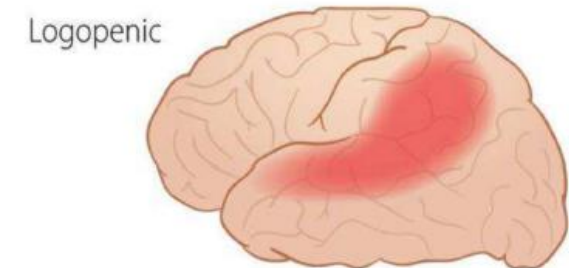
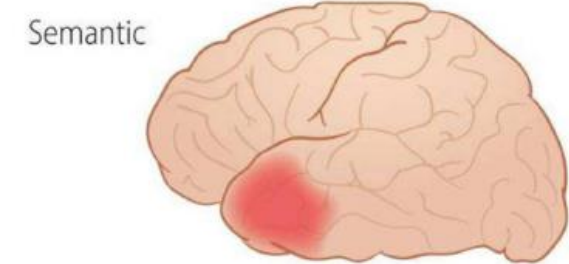
- Progressive deterioration of behavior or social cognition
- Findings
 - Early behavioral disinhibition
 - Early apathy or inertia
 - Early loss of sympathy or empathy
 - Early perseverative, stereotyped, or compulsive/ritualistic behavior
 - Hyperorality and dietary changes
- Neuropsychological profile with executive dysfunction with relative sparing of memory and visuospatial functions

bvFTD

- What it is NOT:
 - New psychosis – hallucinations or delusions
 - ADHD
 - Depression and/or anxiety
 - Memory loss
 - Spatial orientation problems

Primary progressive aphasia

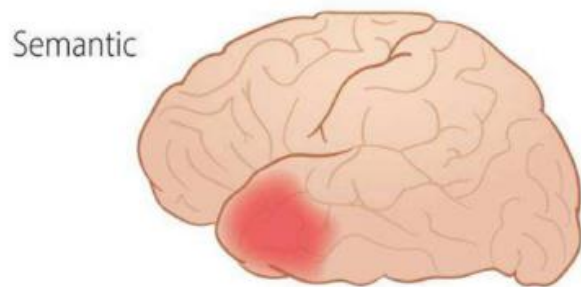
- Progressive loss of language functions due to a neurodegenerative process
- Three variants
 - Semantic variant PPA
 - Non-fluent agrammatic PPA
 - Logopenic PPA



FTD - Primary progressive aphasia

- Semantic PPA – svFTD

- Most commonly due to TDP-43
Type C, other TDPs and Pick's
disease (tau)

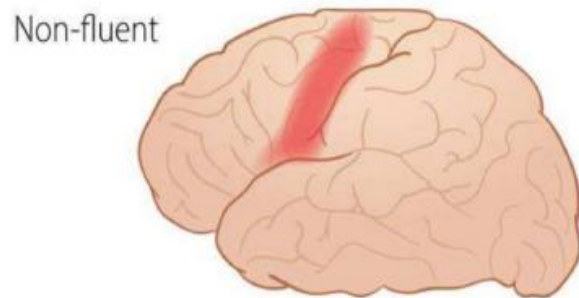


- Impaired confrontational naming and single word comprehension
- Dyslexia, dysgraphia
- Impaired object knowledge esp for low-frequency words
- Repetition intact
- Speech production intact (fluent)
- Grammar intact

FTD - Primary progressive aphasia

- Agrammatic nonfluent PPA – nfvFTD

- Tau pathology, can also be Pick's disease or TDP-43



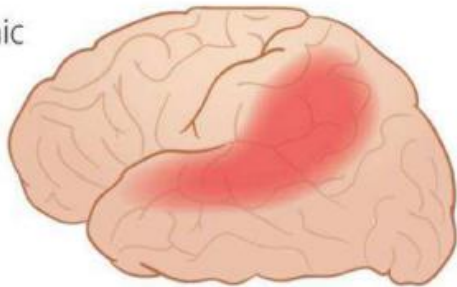
- Agrammatism
- Effortful, halting speech with apraxia of speech
- Impaired comprehension of syntactically complex sentences
- Spared single word comprehension
- Spared object knowledge

Primary progressive aphasia

- Logopenic PPA

- 86-90% due to AD pathology

Logopenic



- “Word finding difficulties” – impaired single-word retrieval in spontaneous speech
 - Phonemic paraphasias – saying “blant” for “plant”
 - Spared single word comprehension and object knowledge
 - Repetition impaired, even for simple sentences
 - Fluency intact, no trouble with motor speech or grammar

Atypical Alzheimer's disease

- Typical Alzheimer's pathology
- Atypical symptoms, atrophy, ?location of pathology, and demographics
- Tends to occur in younger patients with AD
 - Estimated to be around 3% of AD patients
- Three main forms:
 - Logopenic primary progressive aphasia (PPA)
 - Frontal variant – behavioral or dysexecutive
 - Posterior cortical atrophy

Frontal variant AD

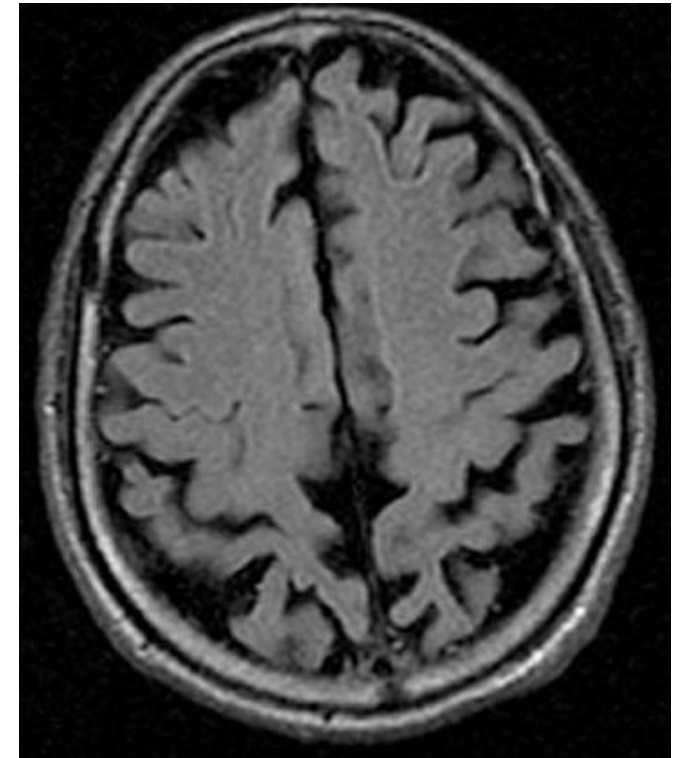
- Rare – 2% of AD
- 7-20% of “FTD” diagnoses clinically are found to have AD pathology
- Dysexecutive variant – trouble with planning, multitasking, organizing, completing projects
 - Not really associated with personality changes aside from prominent apathy
- Behavioral variant – resembles FTD
 - Disinhibition, lack of empathy, disregard of societal norms, obsessive-compulsiveness, occasional hyperorality
 - Can also have delusions and hallucinations – rare in FTD

Posterior Cortical Atrophy

- 96% due to AD pathology
- Mean age of onset of 58.9 yrs, 80% had onset before age 65
- Female > Male

Posterior cognitive dysfunction:

- Complex visuospatial abnormalities
- Apraxia
 - Limb apraxia
 - Dressing apraxia
 - Constructional apraxia
- Prosopagnosia
- Alexia
- Cortical vision loss



Case courtesy of Royal Melbourne Hospital
Neuropsychiatry Unit, Radiopaedia.org, rID: 24746

PCA symptoms

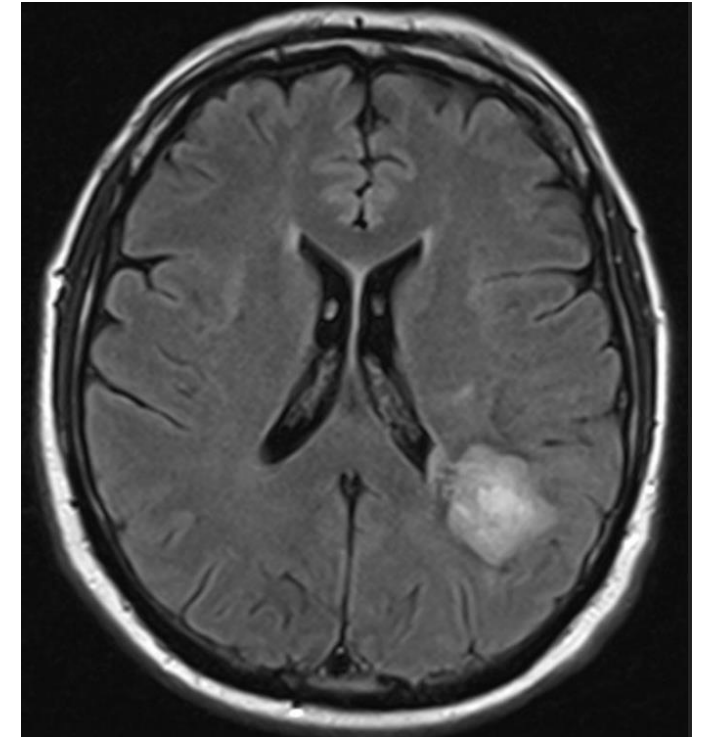
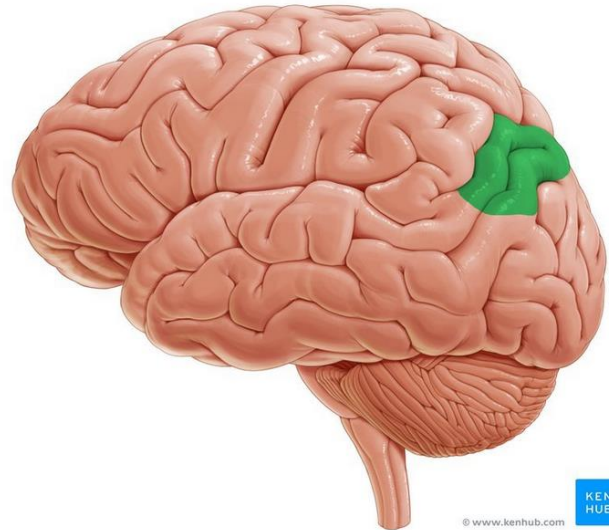
- Trouble finding objects in plain sight
 - Trouble with driving
 - Navigation difficulties esp complex or uneven surfaces
 - Loss of dexterity
 - Trouble with dressing or putting objects together
-
- Preserved insight
 - Sparing of other cognitive domains

Gerstmann syndrome

- Injury to the left angular gyrus

Symptoms:

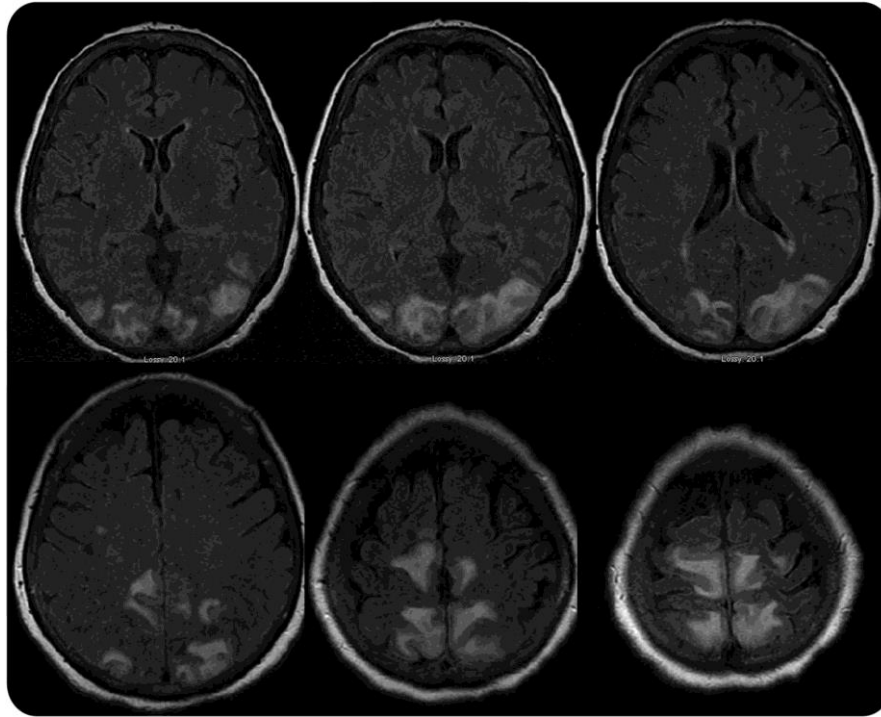
- Left-right disorientation
- Finger agnosia
- Dyscalculia
- Dysgraphia



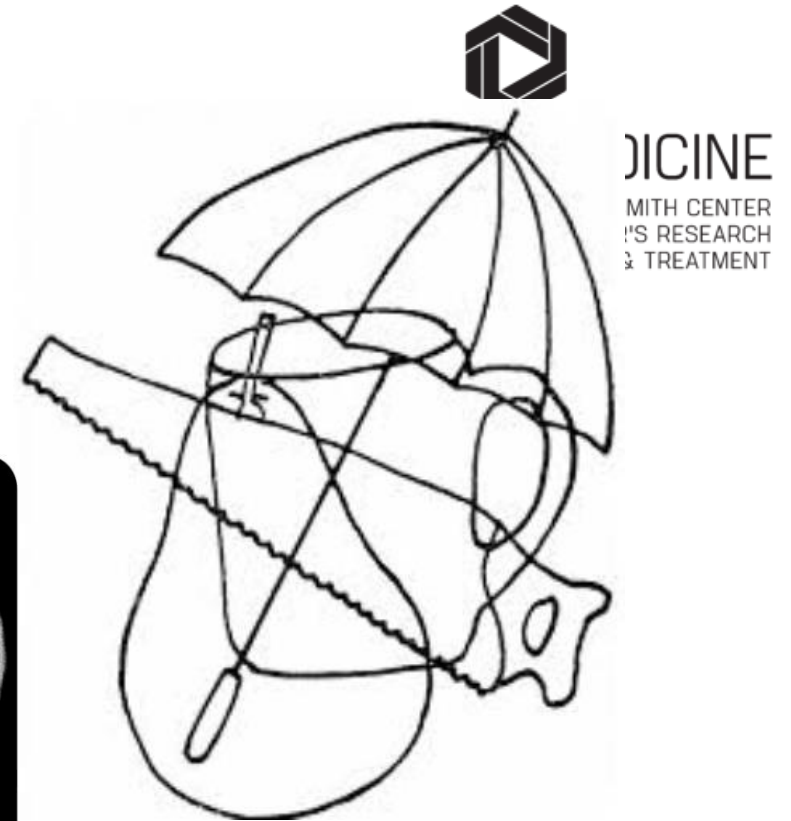
<https://www.eurorad.org/case/14092>

Balint syndrome

- Injury to bilateral parietal lobes
- Simultagnosia
- Optic ataxia
- Oculomotor apraxia



Espay and Allen. *Neurology* 2014;82:1844



EEEE
EE EE
EE EE
EEEEEEEE
EEEEEEEE
EE EE
EE EE
EE EE



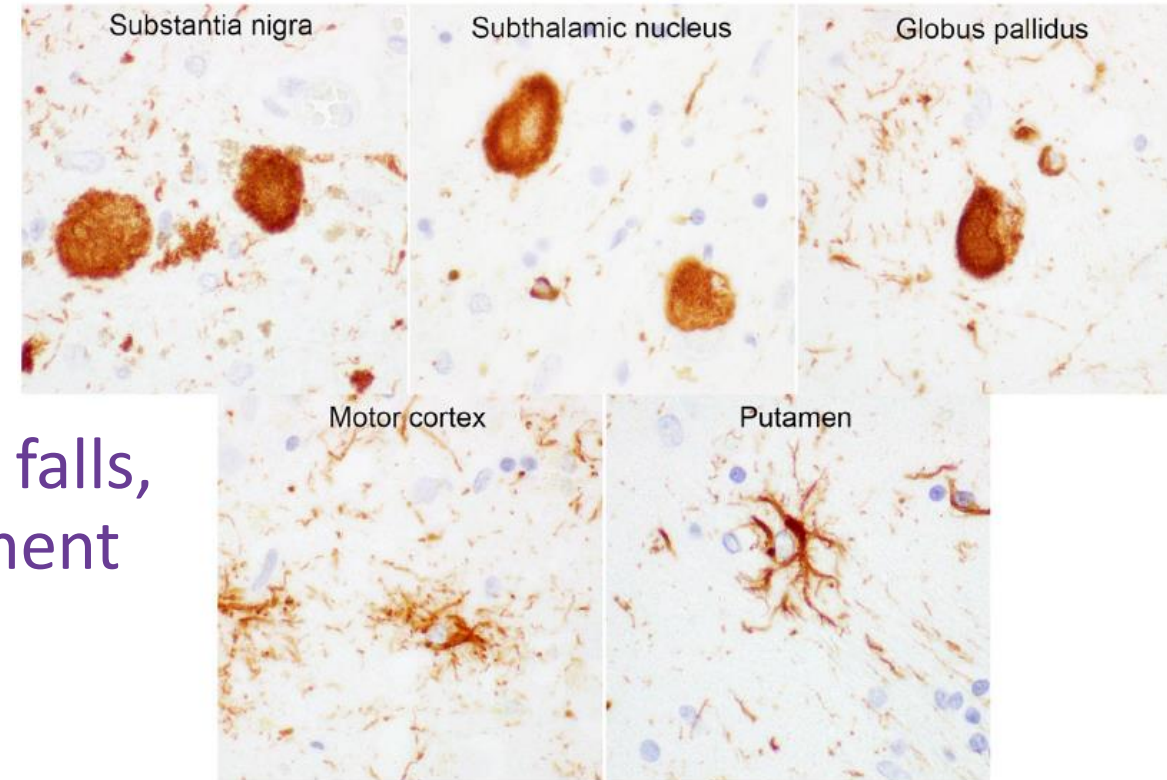
MTH CENTER
FOR RESEARCH
& TREATMENT

Atypical parkinsonism causing dementia

- Lewy body dementia
- Progressive supranuclear palsy
- Corticobasal syndrome

Progressive supranuclear palsy (PSP)

- Tauopathy – 4-repeat tau
- Traditional syndrome of downward gaze palsy, axial parkinsonism with early falls, dysphagia, and frontal cognitive impairment
 - Richardson's syndrome
- Mean age of onset 65, very rare before age 40
- Many variants and subtypes



Dementia in PSP

- Frontal cognitive impairment early in course
 - 70% of PSP patients will develop dementia during course
 - 10% initially present for evaluation of cognitive changes
- Speech apraxia and non-fluent aphasia
- Executive dysfunction, trouble with sequencing

Dementia in PSP

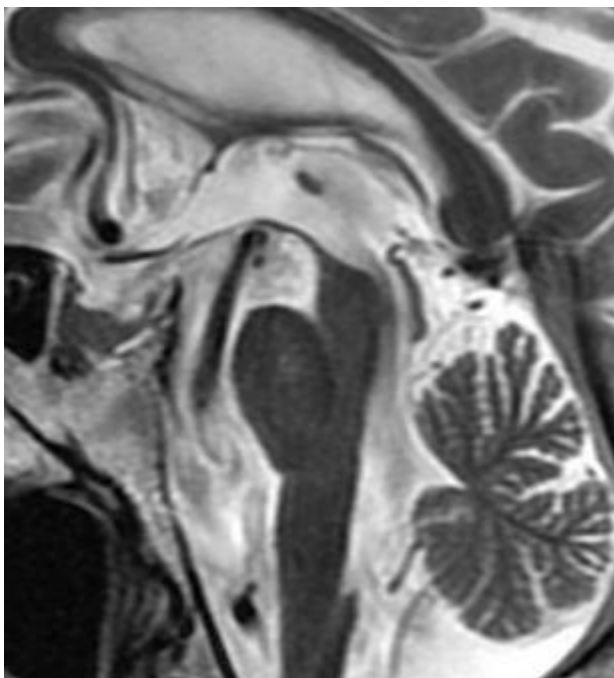
- Disinhibition and perseveration
 - Positive applause sign
 - Emotional lability, pseudobulbar affect
 - Compulsive behavior, inappropriate behavior
- Attention/immediate memory
 - Up to 1/3 of patients with episodic memory and/or visuospatial deficits
- Prominent apathy and bradyphrenia



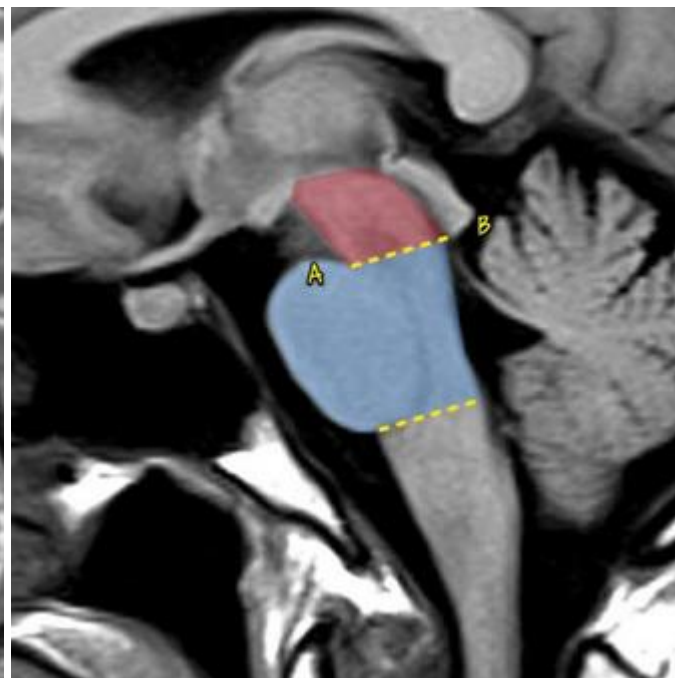
SIU MEDICINE

MRI findings – midbrain atrophy

Variant PSP may not always show these findings

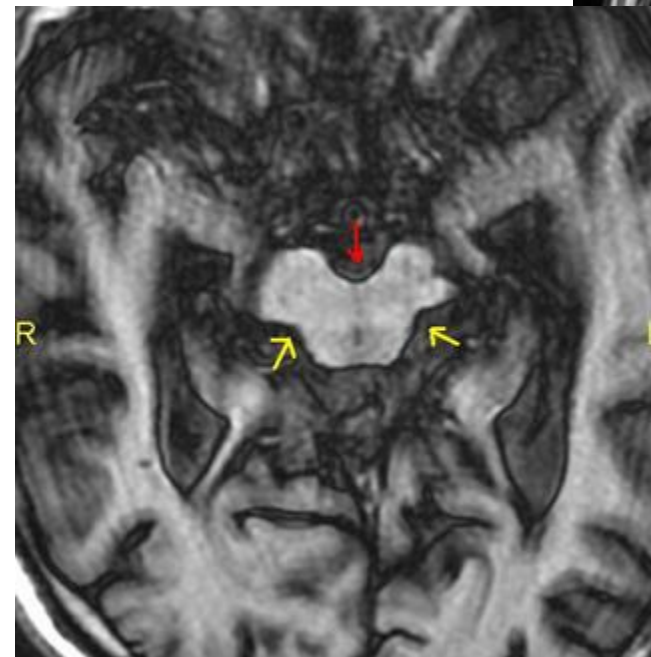


Hummingbird sign
Penguin sign



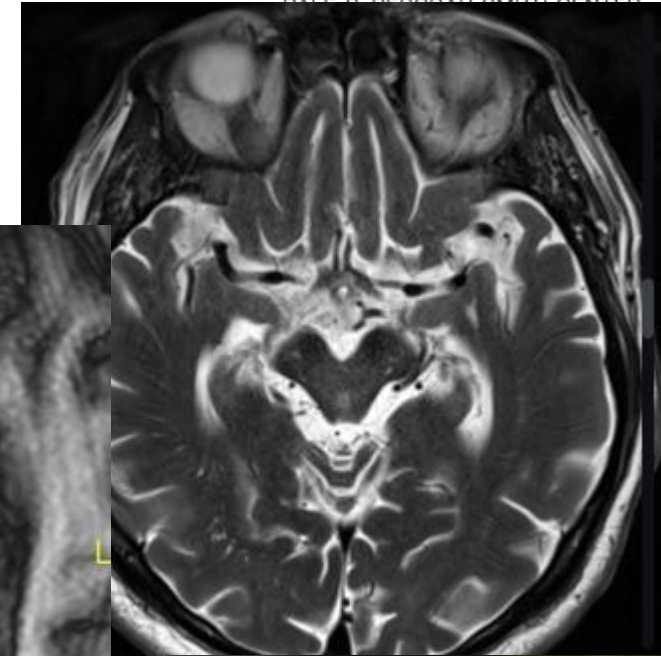
Midbrain-to-pons ratio

Normal is ~ 0.24
PSP < 0.16



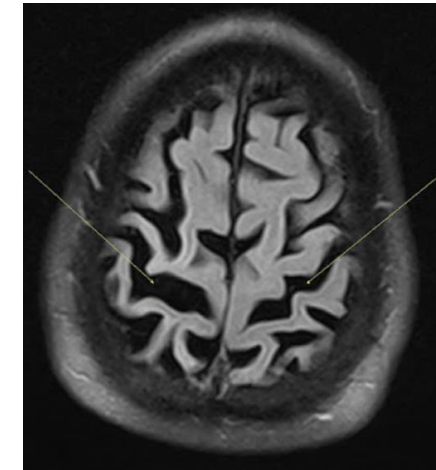
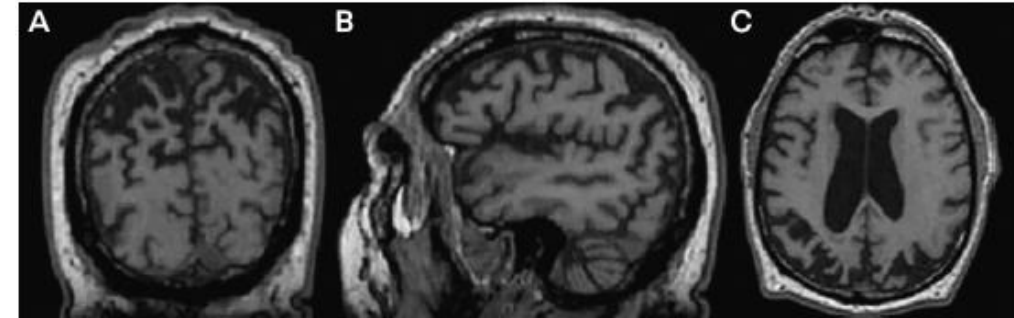
Mickey mouse sign

Morning glory sign



Corticobasal syndrome

- Clinical presentation
 - Asymmetric parkinsonism with focal dystonia and cortical findings
- Corticobasal degeneration: specific 4R-tau pathology
 - Only about 50% of cases of CBS show this
- 20-25% due to AD and PSP pathology each
- Average age of onset 64, rare before age 45



Corticobasal syndrome

Clinical presentation:

- Very asymmetric parkinsonism
 - Often without tremor, not responsive to levodopa
 - Early balance problems
- Dystonia in limbs
- Dysarthria, dysphagia
- Cortical signs
 - Sensory loss
 - Limb apraxia
 - Hyperreflexia
 - Cortical myoclonus
 - Alien limb phenomenon – 20%
- Cognitive impairment

Cognitive impairment in CBS

- Executive dysfunction
- Behavioral changes
 - Disinhibition
 - Difficult to distinguish from bvFTD
 - Pseudobulbar affect
- Recognizing facial emotions
- Apraxia
 - Limbs, eyelid, gait
 - Speech
- Aphasia – most often nonfluent
- Visual or spatial neglect
- Balint syndrome, Gerstmann syndrome
- Memory loss – especially in pathological AD

Chronic Traumatic Encephalopathy (CTE)



SIU MEDICINE
DALE & DEBORAH SMITH CENTER
FOR ALZHEIMER'S RESEARCH
& TREATMENT

- Tauopathy – accumulates in a different pattern
 - TDP-43 also positive in hippocampus, amygdala, and other areas
- Related to repeat head injuries
 - Sports – football, soccer, hockey, boxing, wrestling
 - Military service
- Memory, executive dysfunction, and anger control/behavior problems
- Parkinsonism is a later feature



Irv Cross

CTE

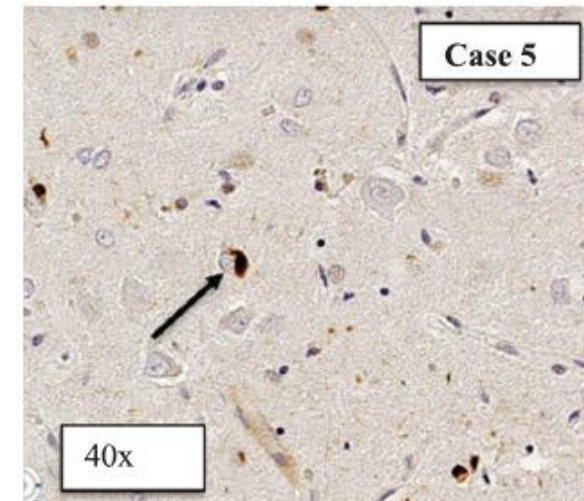
Symptoms at onset:

- **Memory impairment (85%)**
- Executive dysfunction (79%)
- Attention and concentration trouble (73%)
- Sadness/depression (64%)
- Hopelessness (64%)
- **Explosivity (58%)**
- Language impairment (58%)
- Visuospatial difficulties (55%)
- “out of control” (52%)
- Physically violent (52%)
- Verbally violent (49%)
- Impulse control problems (46%)
- Suicidal ideation/attempts (30%)
- Motor symptoms (30%)

LATE

Limbic-predominant Age-related TDP-43 Encephalopathy

- Named in 2019
- Most prevalent neurodegenerative pathology in the oldest-old
 - Pathologic changes seen in up to 40% of autopsies >85 years old
 - In isolation without other path changes in up to 20%
- Due to the accumulation of TDP-43, especially in the anterior hippocampus
 - With associated atrophy often more severe than seen in AD
- Slower progression than AD and memory-predominant without other cognitive symptoms



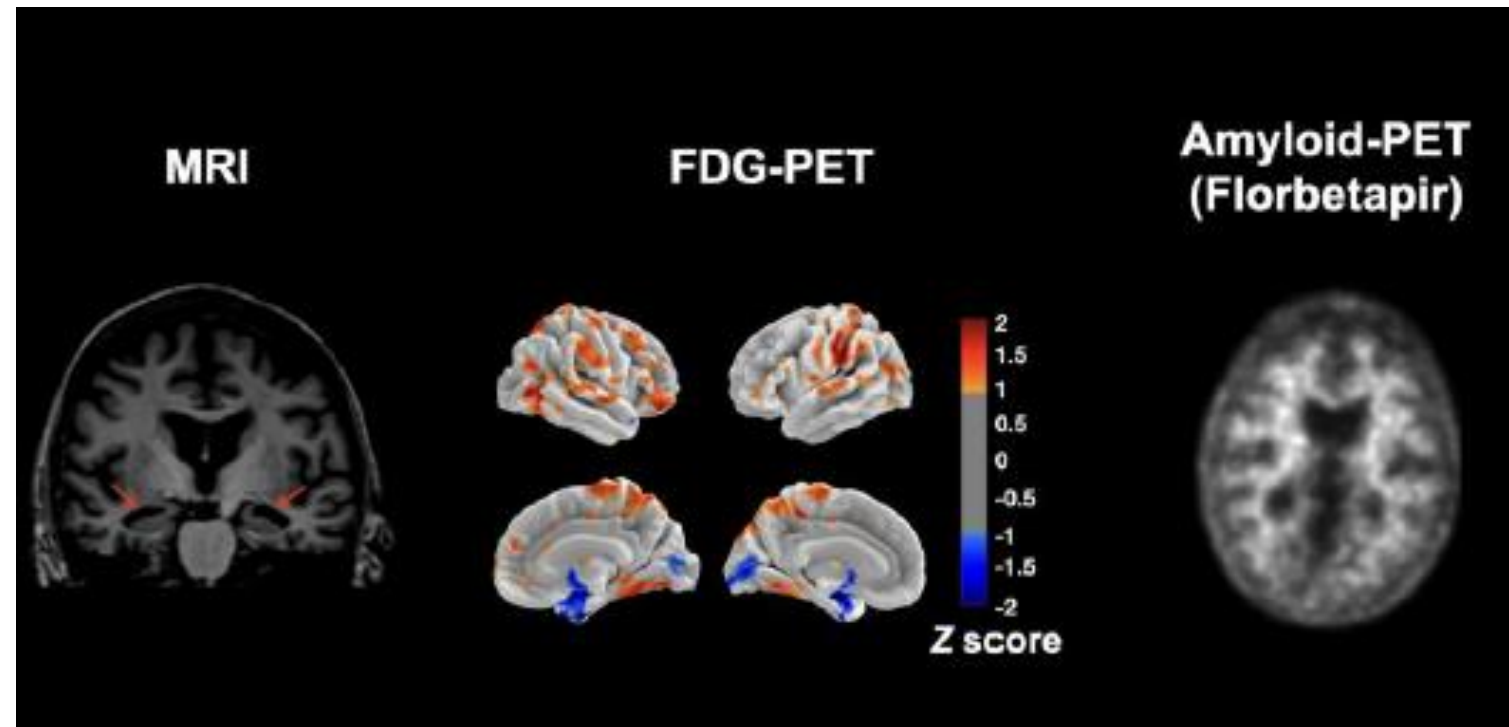
LATE clinical features

- Older age (proposed criteria is ≥ 75 years)
- Mild symptoms with largely preserved cognition
 - Impaired semantic memory out of proportion to this
- Hippocampal atrophy out of proportion to severity of symptoms
- Slow progression
- If more severely affected, more rapidly progressing, and/or other domains affected, likely copathologies present

LATE

- MRI showing focal hippocampal atrophy
- Amyloid and tau-PET negative
- FDG-PET with medial temporal lobe and limbic hypometabolism
 - Parietal lobes and precuneus region unaffected
- Still being characterized

Corriveau-Lecavalier N et al. *Brain Commun* 2024;6:fcae183



Why does it matter?

- Many patients will come in with reported “memory” problems
 - A lot of these are not truly memory – executive dysfunction, language, attention
- Comorbidities vary
- Risks and genetics vary
- Diagnostic clarity for patients and families
- Treatments vary
 - Cholinesterase inhibitors – for AD, PD and Lewy body dementia
 - Alzheimer’s disease – anti-amyloid therapy
 - All: supportive care, exercise and activity

Summary

- Different types of dementia have different pathological causes and different symptoms
- Clinical history, neurological exam, and basic structural imaging are critical to assist with diagnosis
- We need more diagnostic testing for the atypical diseases
- More research is needed in these atypical diseases
- Treatment remains mostly symptomatic and supportive



Thank you!



SIU MEDICINE

DALE & DEBORAH SMITH CENTER
FOR ALZHEIMER'S RESEARCH
& TREATMENT



SIU MEDICINE

DALE & DEBORAH SMITH CENTER
FOR ALZHEIMER'S RESEARCH
& TREATMENT