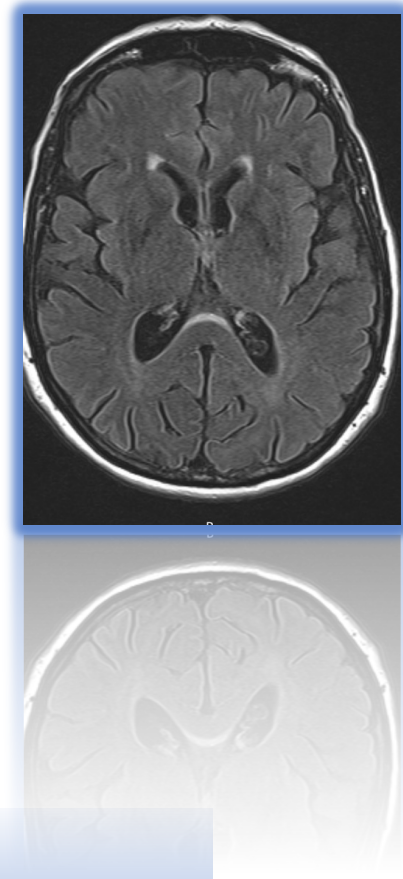


Imaging for Dementia with Clinical Cases

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APP2APP Virtual Lectures, Inc

<https://app2app.org/>



Objectives

1. Purpose of imaging for patients with cognitive complaints
2. Recognize the most common dementia diagnoses
3. Differentiate between the Four *Functional* Cognitive Systems
4. Recognize MRI and PET Imaging that correlates with different dementia diagnoses

Purpose of Imaging for Patients with Cognitive Complaints:

- **Primary purpose** of MRI is to **exclude** possible **structural** causes:
 - Tumors
 - Strokes (large vessel)
 - Subdural hematomas
 - Inflammatory processes (eg: infectious/autoimmune dz, etc..)
 - Normal Pressure Hydrocephalus (NPH) **Triad**: ↓ cognition, urinary incontinence, gait dist.
- **MRIs** can be helpful to increase or decrease our suspicion of a neurodegenerative disease, by showing **patterns** of **regional atrophy**, which often point to specific **underlying pathology**.
- If MRI is **equivocal**, we may consider functional imaging, such as an **FDG PET**, to look for **patterns** of **regional hypometabolism**.

Ultimately, we are asking ourselves two questions:

- *Does imaging correlate with our patients' clinical syndrome (and NP testing)?*
- *OR, do our findings support a psychiatric or metabolic cause of cognitive complaints?*

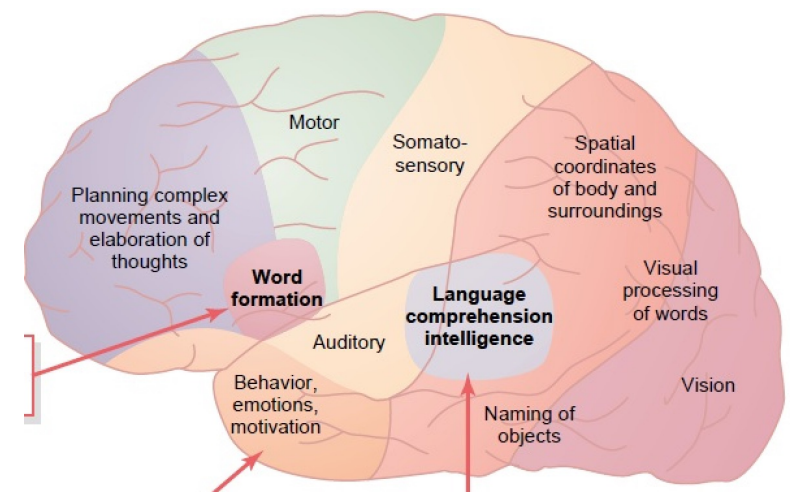
Most Common Dementia Diagnoses

Proteinopathy key:

- Amyloid plaques and tau tangles
- TDP 43
- Tauopathy (various types)
- Alpha synuclein

1. Alzheimer's Disease [memory and learning]
2. Posterior Cortical Atrophy (PCA) [visuospatial and object recognition]
3. Logopenic Primary Progressive Aphasia (lvPPA) [language]
4. Semantic Primary Progressive Aphasia (svPPA) [language]
5. Agrammatic/non-fluent Primary Progressive Aphasia (nfPPA) [language]
6. Behavioral Variant of FTD (bvFTD) [behavior, attention, executive]
7. Dementia of Lewy Bodies (DLB) [visuospatial, executive, attention]

Four *Functional* Cognitive Systems



- 1. Medial Temporo-Limbic Network: memory and learning**
 - ✓ Alzheimer's Dementia and MCI with AD etiology
- 2. Occipito-Temporal /Occipito-Parietal Network: visuospatial and object recognition**
 - ✓ Posterior Cortical Atrophy (PCA)
 - ✓ Dementia of Lewy Bodies (DLB)
- 3. Front-Temporal Network: executive, attention, behavior (*DLB will have prominent exec/atten deficits)**
 - ✓ Behavioral Variant of Frontotemporal Dementia (bvFTD)
 - ✓ Behavior Variant of Alzheimer's Disease
- 4. Perisylvian Language Network: language [primary presenting problem and prominent sx]**
 - ✓ Primary Progressive Aphasia- Logopenic (lvPPA)
 - ✓ Primary Progressive Aphasia- Semantic (svPPA)
 - ✓ Primary Progressive Aphasia- Agrammatic/Non-fluent (nfvPPA)

Clinical Vignette 1

Clinical Vignette 1- History

58 y/o R-handed F presents w/ “**memory problems**” x 1.5 yrs. Ed = 20 yrs. PhD in immunology. Worked 25 yrs as a infectious disease researcher. She retired last year due to an “inability to perform her duties”.

Per her husband,

- She is fairly accurate recalling details of recent events. Endorses some **word-finding** problems, mostly recalling proper names of celebrities she used to know.
- Used to be an avid reader, but now she barely reads at all.
- C/o **difficulty reading**. Optometry and ophthalmology evals have been unsuccessful in procuring effective reading glasses, in spite of multiple attempts.
- Her **handwriting** has **significantly deteriorated**, and she has difficulty with **buttons** and **zippers** when **dressing**.
- She had a **four fender-benders** in the last year, and she reported some **confusion navigating** in familiar areas.
- **two falls** in the last 6 mos. One going down curb, the second going down steps.
- Still cooks (recipes can recall spontaneously), does laundry, cleans house (not as well). **Husband had to take over managing finances** last year.

1. **Medial Temporo-Limbic Network:**
memory and learning
2. **Occipito-Temporal /Occipito-Parietal Network:** vision and object recognition
3. **Fronto-Temporal Network:** executive, attention, behavior
4. **Perisylvian Language Network:**
language

Zoom Poll: Clinical Vignette 1- DDx

1. Which of the four main functional cognitive systems is most affected in this patient?

a) Choose from box on R →

2. What would be your top differential diagnoses?

(you may choose one or more than one)

- a) Alzheimer's Disease/MCI driven by AD
- b) Posterior Cortical Atrophy
- c) Logopenic Variant PPA
- d) Semantic Variant PPA
- e) Dementia of Lewy Body

- 1. Medial Temporo-Limbic Network:**
memory and learning
- 2. Occipito-Temporal /Occipito-Parietal Network:** vision and object recognition
- 3. Fronto-Temporal Network:**
executive, attention, behavior
- 4. Perisylvian Language Network:**
language

Zoom Poll: Clinical Vignette 1- Cognitive Testing

1. What sort of cognitive tests would you expect to see scores below norms for age and level of education for this patient?

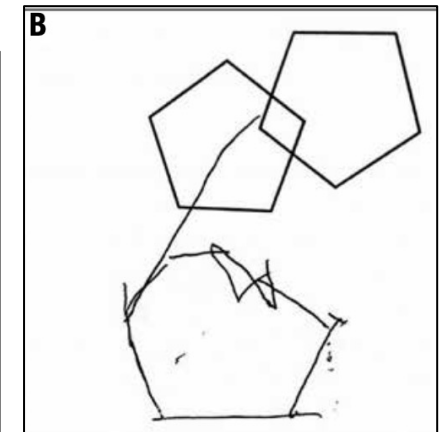
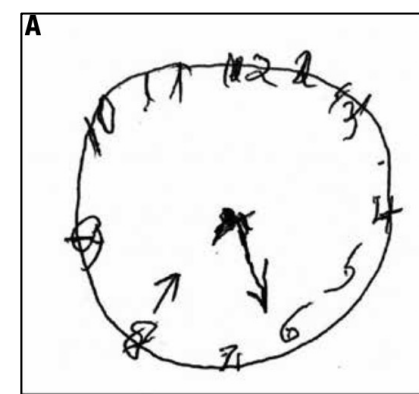
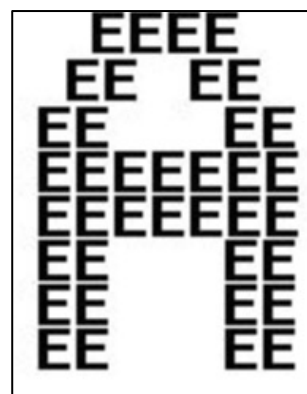
(You may choose one or more than one response)

- a) Word List Recall
- b) Animals *(Name as many animals as you can in one minute)*
- c) Calculations (# of nickels in \$1; # of quarters in \$6.75)
- d) Clock draw

Clinical Vignette 1- Testing

- Bedside **visual field testing** was inconsistent.
- **Memory**: Was able to encode a 5-element name and address first try. After a 5-min delay, she recalled 5/5 elements spontaneously.
- **Language (semantic)**: able name 22 animals and 13 vegetables; **(phonemic)** named 20 F-words.
- + **Silmultanagnosia**: able to identify smaller numbers in Navon letters, but failed to appreciate global figures. Had trouble describing the **Cookie-Thief picture** (eg: boy was “leaning backwards” and mother was a “making breakfast”).
- + **Acalculia**: UNABLE to calculate nickels in \$1.00 (=30) or quarters in \$6.75 (=9).
- Had difficulty w/ **clock-draw** and **Benson-copy**.
- **Remainder of neurological exam was normal**

1. **Medial Temporo-Limbic Network**: memory and learning
2. **Occipito-Temporal /Occipito-Parietal Network**: vision and object recognition
3. **Fronto-Temporal Network**: executive, attention, behavior
4. **Perisylvian Language Network**: language

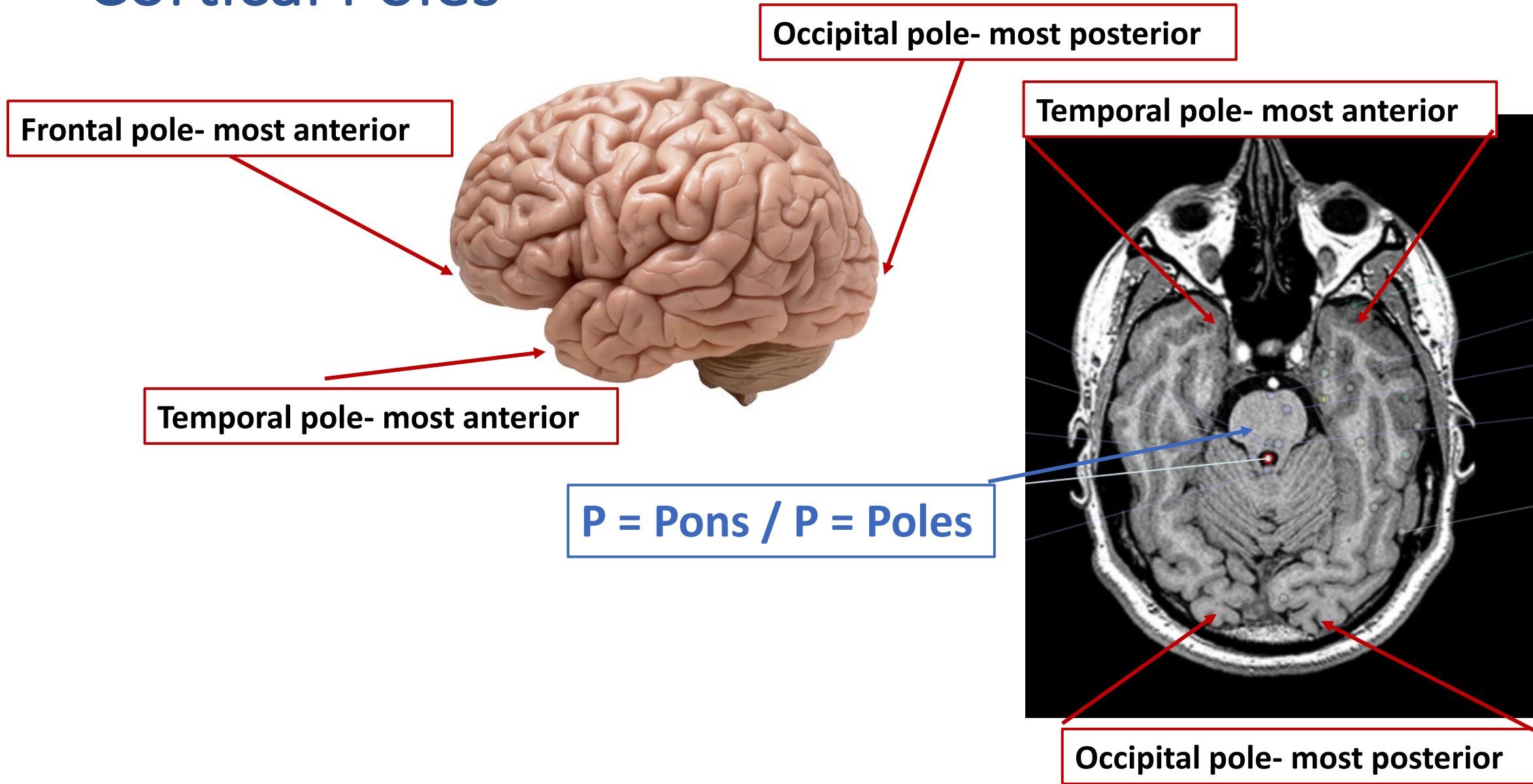


Four *Functional* Cognitive Systems

1. **Medial Temporo-Limbic Network:** memory and learning
 - ✓ Alzheimer's Dementia and MCI with AD etiology
2. **Occipito-Temporal /Occipito-Parietal Network:** vision and object recognition
 - ✓ **Posterior Cortical Atrophy (PCA)**
 - **MRI:** parieto-occipito or occipito-temporal atrophy (**posterior cingulate gyrus involved**)
 - ✓ **Dementia of Lewy Bodies (DLB)**
 - **MRI:** often normal. May have occipito-parietal atrophy (**posterior cingulate gyrus spared**)
3. **Front-Temporal Network:** executive, attention, behavior (***DLB will have prominent exec/atten deficits**)
 - ✓ Behavioral Variant of Frontotemporal Dementia (bvFTD).
 - ✓ Behavior Variant of Alzheimer's Disease
4. **Perisylvian Language Network:** language [primary presenting problem, most debilitating problem]
 - ✓ Primary Progressive Aphasia- Logopenic (lvPPA)
 - ✓ Primary Progressive Aphasia- Semantic (svPPA)
 - ✓ Primary Progressive Aphasia- Agrammatic/Non-fluent (nfvPPA)
 - *Covered in Primary Progressive Aphasia lecture

Review of Pertinent Anatomy for Imaging

Cortical Poles



Brain Stem Axial View

Brain Stem (*inferior* → *superior*)

A. Medulla oblongata

B. Pons

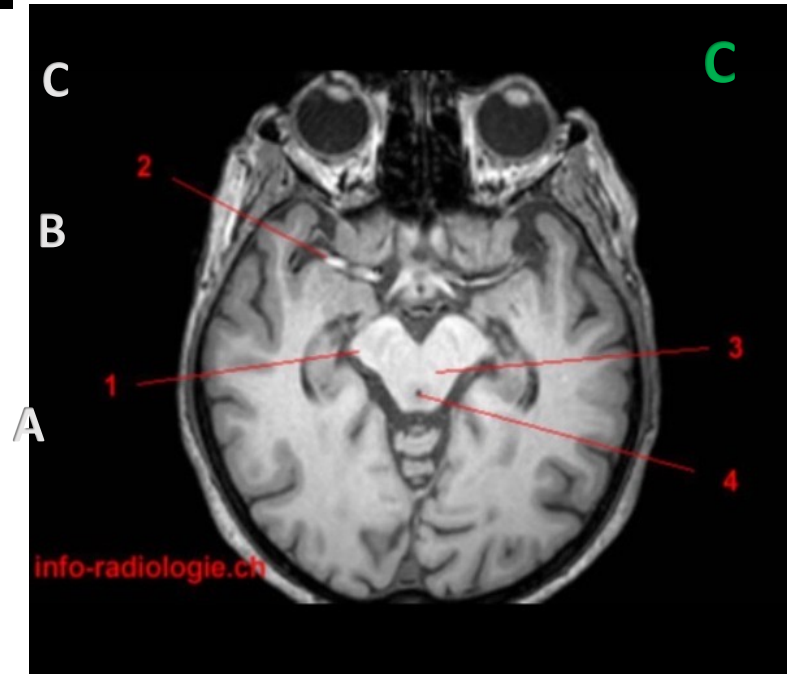
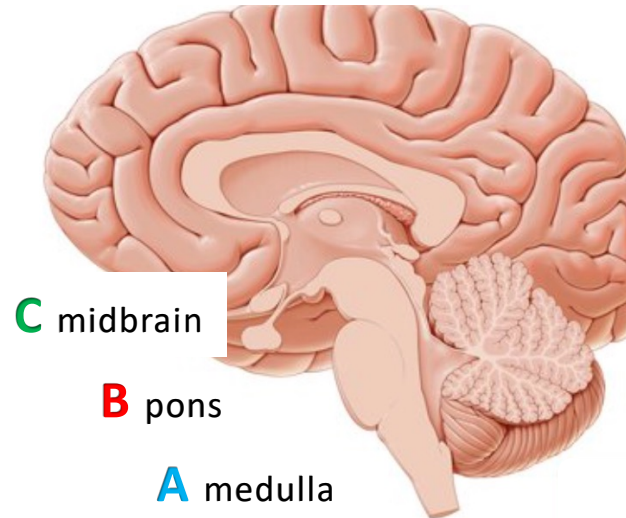
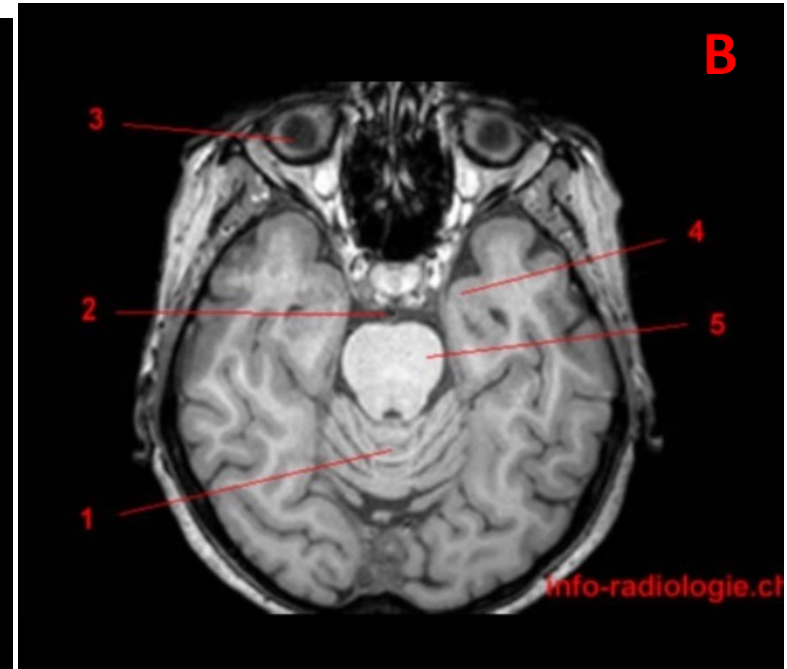
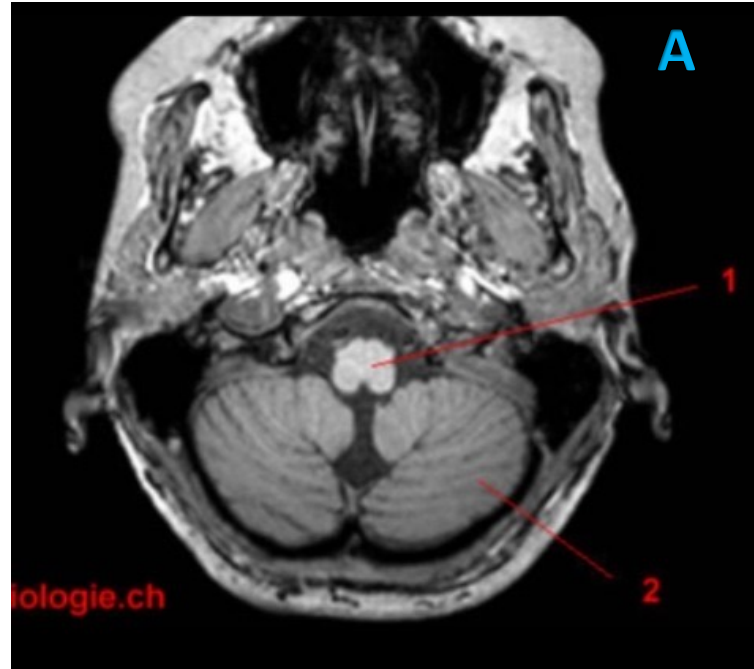
C. Midbrain (note: cerebral crus)

Cerebellum

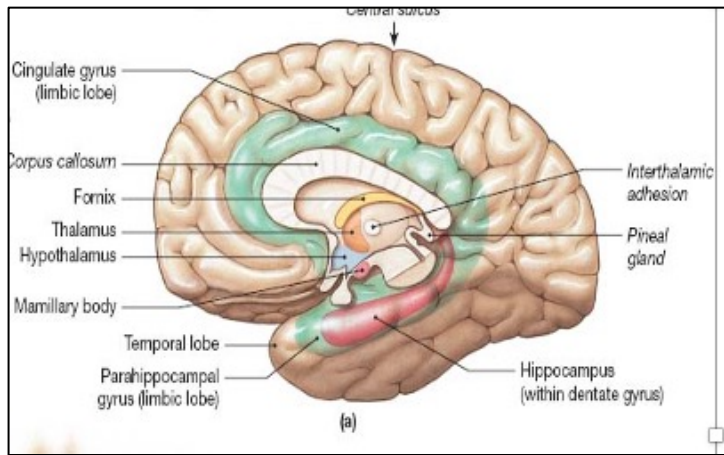
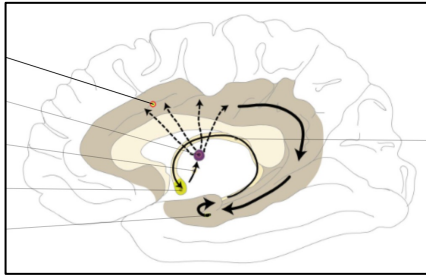
Temporal lobes

Parietal lobes:

- At the level of the **medulla**, look at the **cerebellum**.
- At the level of the **Pons**, look at the **Poles (temporal and occipital)**.
- At the level of the **midbrain**, look at **hippocampi** and the **temporal horns**.



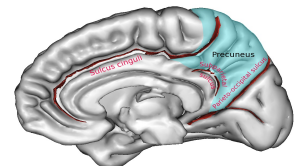
Cingulate Gyrus



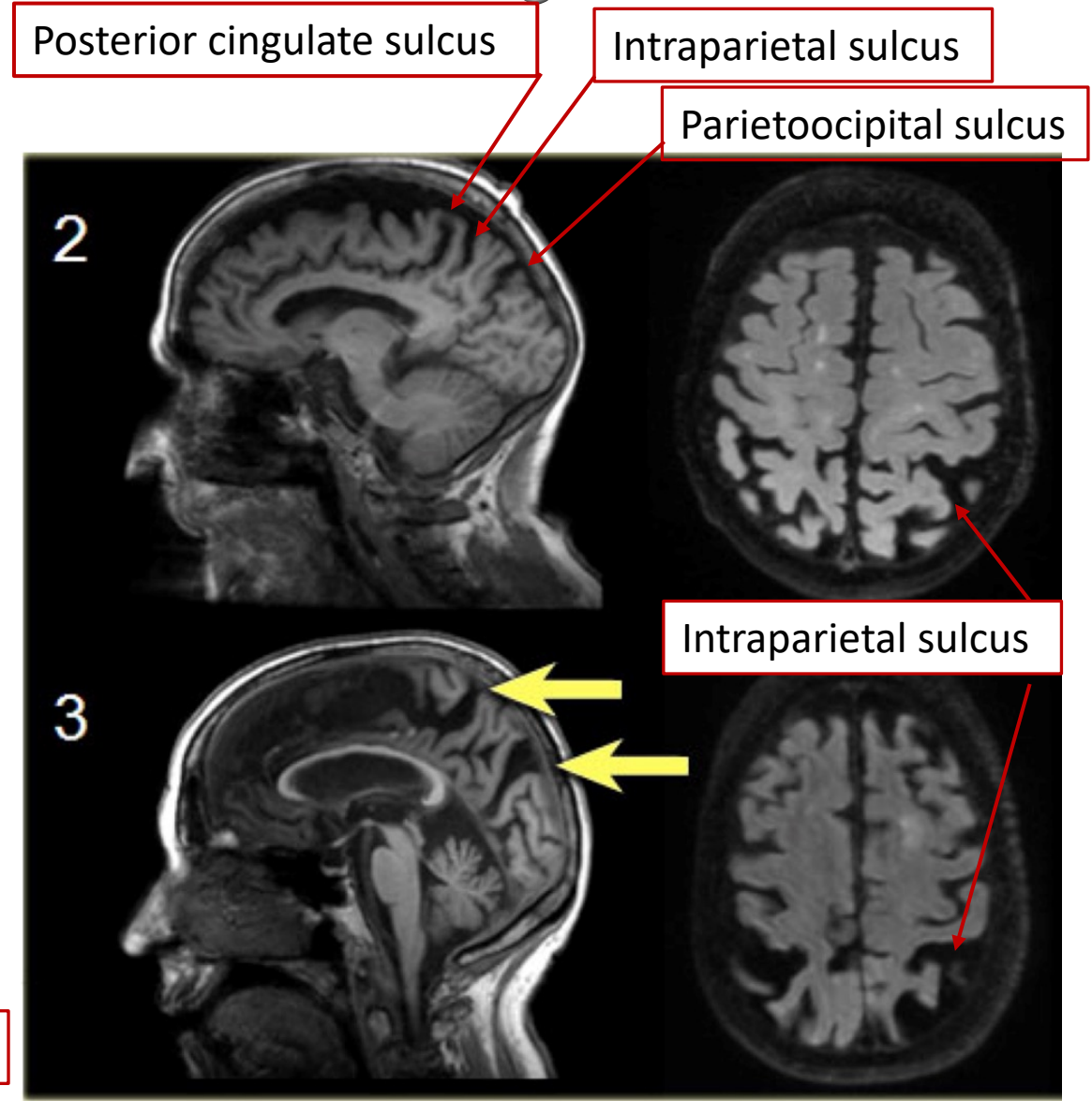
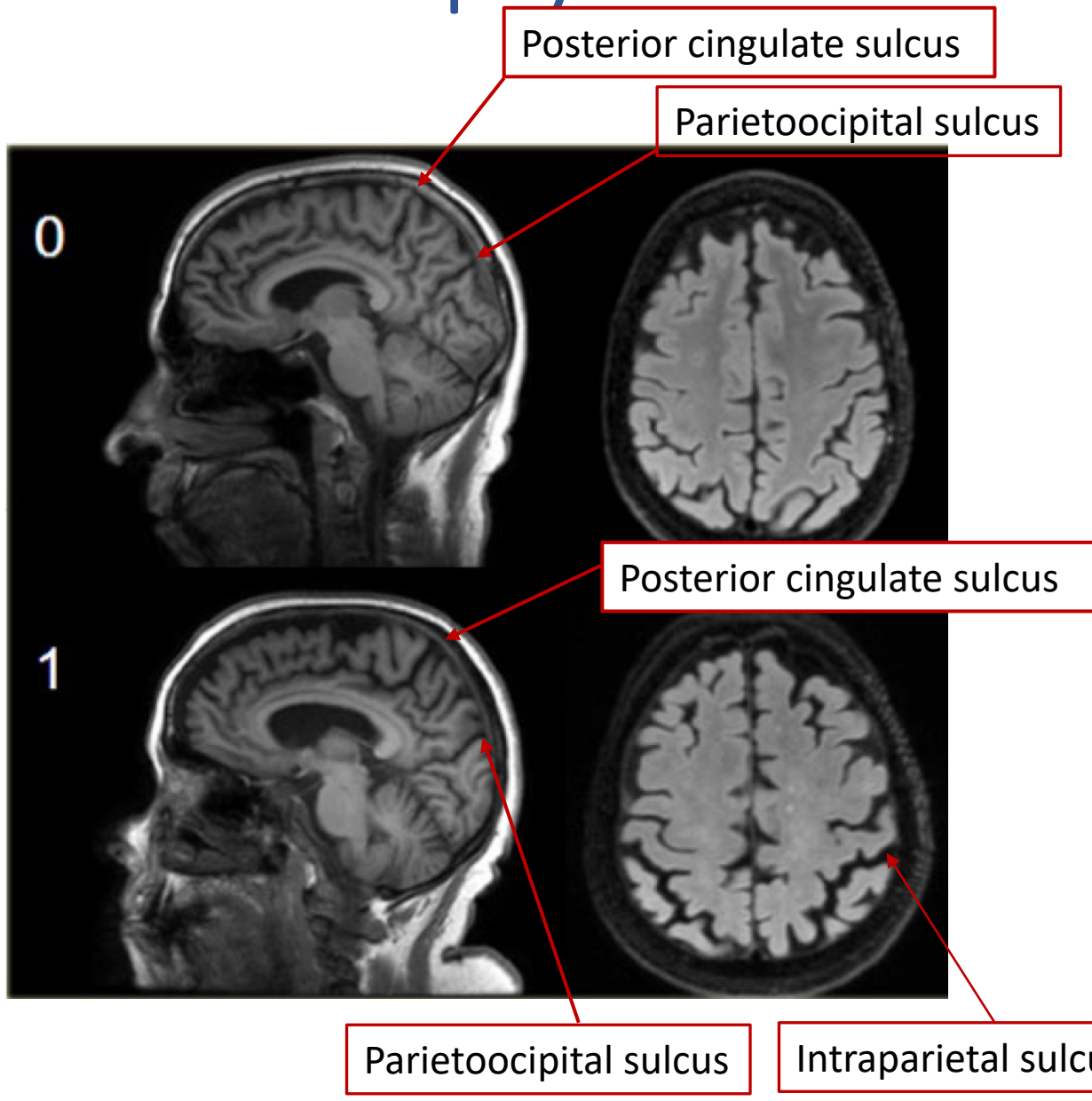
Posterior cingulate sulcus



Parietal Atrophy

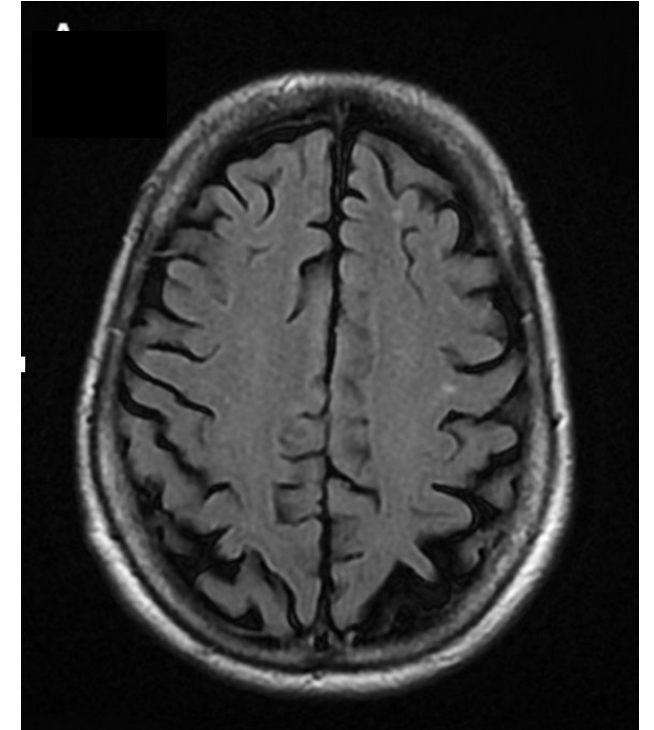
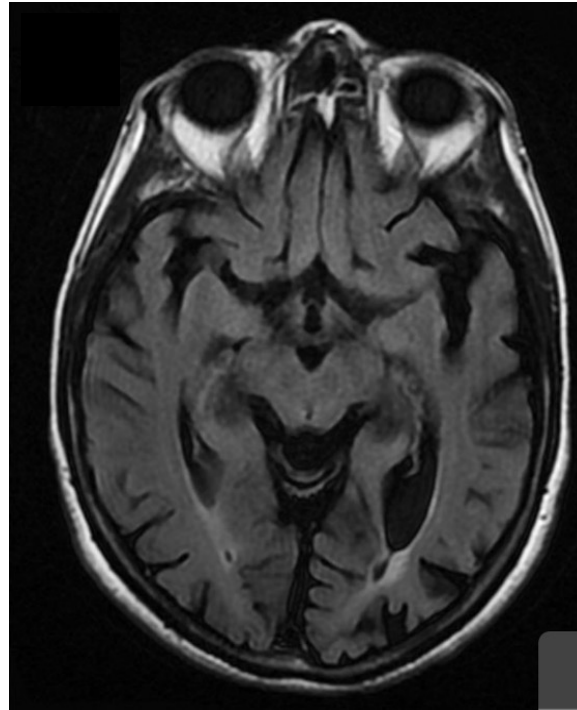
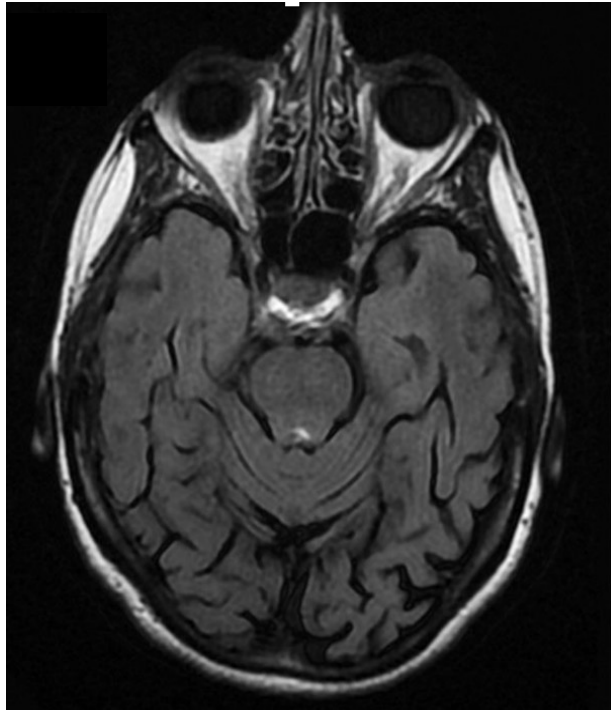
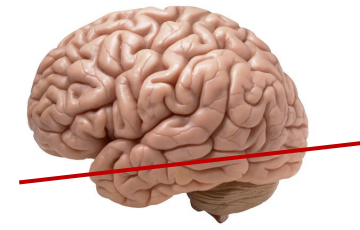


Precuneus

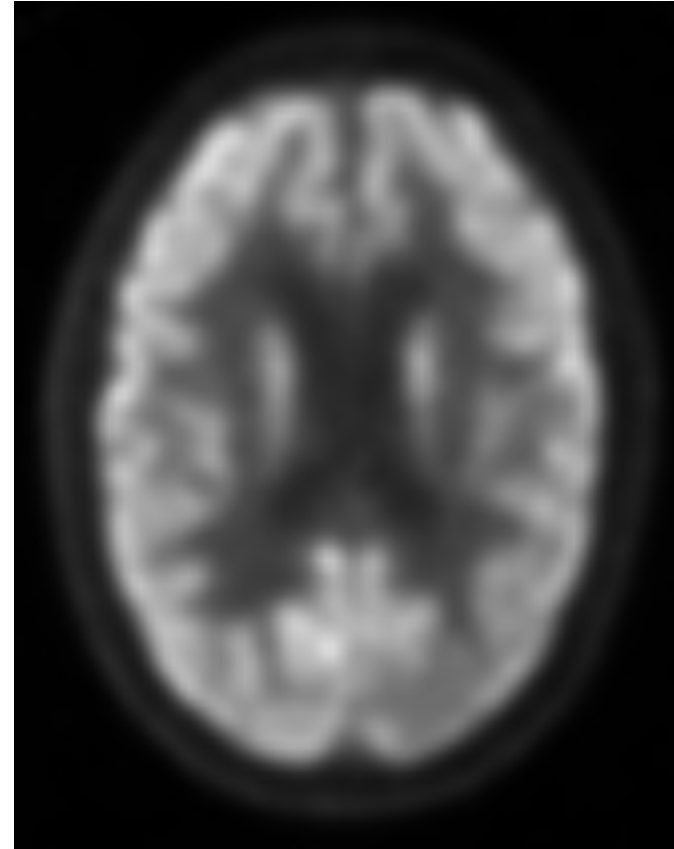
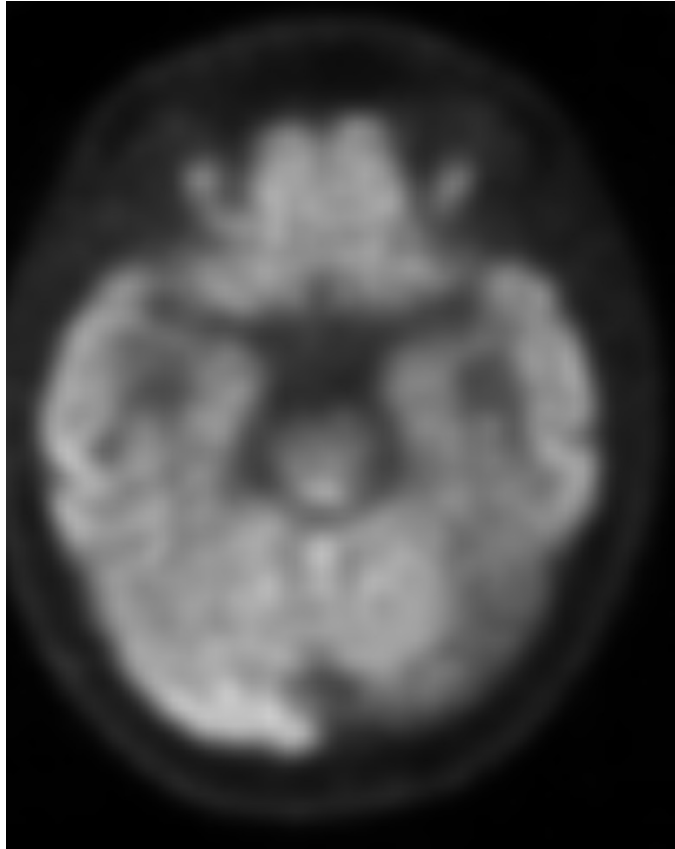


REF: <http://www.radiologyassistant.nl/en/p43dbf6d16f98d/dementia-role-of-mri.html>

Clinical Vignette 1 - MRI



Clinical Vignette 1 - FDG PET



Hypometabolism L occipital lobe, L temp lobe, and biparietal L>R. Left posterior cingulate involved.

FDG = fluorodeoxyglucose F 18- a glucose analog tagged w/ a radiotracer.- uptake in this image is white.

Clinical Vignette 1 – Diagnosis

1. **Medial Temporo-Limbic Network:** memory and learning
2. **Occipito-Temporal /Occipito-Parietal Network: vision and object recognition**
 - ✓ **Posterior Cortical Atrophy (PCA)**- most often due to **AD pathology**.
 - ✓ **MRI:** occipito-parietal/occipito-temporal atrophy (posterior cingulate *involved*)
 - **FDG PET:** hypometabolism in same areas.
 - ✓ **Dementia of Lewy Bodies (DLB)**-
 - **MRI:** often normal or occipito-parietal atrophy (posterior cingulate gyrus will be *spared*)
 - **FDG PET:** hypometabolism in same areas, look for “*cingulate Island*” sign
3. **Fronto-Temporal Network:** executive, attention, behavior.
4. **Perisylvian Language Network:** PPAs- language.

Clinical Vignette 2

Clinical Vignette 2- History

75 y/o R-handed M presents with “**memory problems**” x 2 yrs. ED = 18 yrs. MS in Civil Engineering. Worked for Cigna x 30 yrs. Retired 2 yrs ago, memory was contributory.

1. **Medial Temporo-Limbic Network:** memory and learning
2. **Occipito-Temporal /Occipito-Parietal Network:** vision and object recognition
3. **Fronto-Temporal Network:** executive, attention, behavior
4. **Perisylvian Language Network:** language

Per his wife,

- He will **forget** something she said 10 min later. **Misplaces** items more. **Repeats** often.
- He **searches for words** frequently, will substitute wrong words w/o self correction.
- **Missed** a few doctors **apts**, and was **late paying bills**, so his wife now assists with apts and she is monitoring bill pay, but pt is still performing task.
- Pt continues to complete minor electrical, plumbing, and carpentry repairs in the home, well. However, tasks seem to **take him longer**.
- He manages his own meds, cooks simple meals, and helps with laundry.
- Seems less sure of himself driving, stays close to home.
- A bit **more anxious**, seems to **anger more easily**, especially when he forgets things. Does not seem depressed.

Zoom Poll: Clinical Vignette 2 - DDx

1. Which of the four main functional cognitive systems is most affected in this patient?

a) Choose from box on R →

2. What would be your top differential diagnoses?

(you may choose one or more than one)

- a) Alzheimer's Disease/MCI driven by AD
- b) Behavioral Variant FTD
- c) Logopenic Variant PPA
- d) Semantic Variant PPA
- e) Dementia of Lewy Body

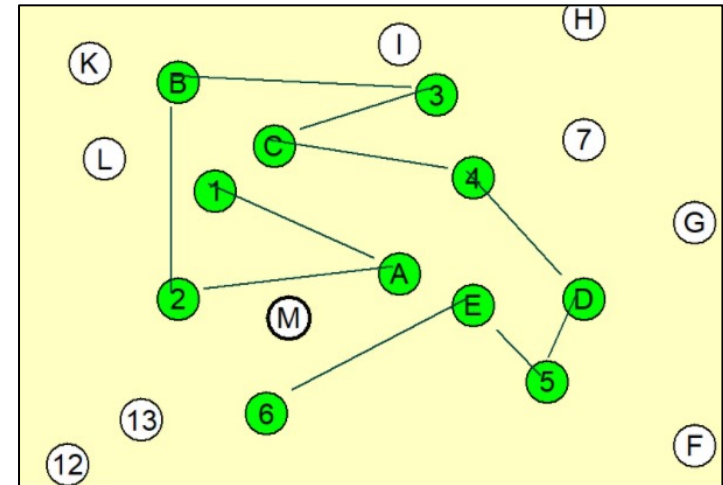
- 1. Medial Temporo-Limbic Network:**
memory and learning
- 2. Occipito-Temporal /Occipito-Parietal Network:** vision and object recognition
- 3. Fronto-Temporal Network:**
executive, attention, behavior
- 4. Perisylvian Language Network:**
language

Clinical Vignette - 2 Testing

Exam and NP testing:

- MoCA score = 26/30, lost 4 on word recall.
- Able to encode 3/5 (2,2,3) of a 5-elements name/address.
- After a 5 min delay, able to recall 1/5; with multiple choice cues 2/5.
- Correctly recognized only 15 of 20 words on a word list.
- Able to name 13 F-words (phonemic fluency) and 10 animals (semantic fluency)
- Boston Naming = 28/30.
- Trails B was in low normal range (1 → A, 2 → B, etc)
- All other scores were WNL.

Remainder of neurological exam: unremarkable.



Focus: Four Major *Functional* Cognitive Systems

1. Medial Temporo-Limbic Network: **memory and learning**

✓ **Alzheimer's Dementia** and **MCI** with **AD etiology**

○ **MRI:** MTL (ie: hippocampal/parahippocampal gyri), posterior parietal cortical atrophy. **SWI/GRE-** microhemorrhages/superficial siderosis.

2. Occipito-Temporal /Occipito-Parietal Network: vision and object recognition

3. Fronto-Temporal Network: executive: attention, behavior.

4. Perisylvian Language Network: PPAs- language.

Review of Pertinent Anatomy for Imaging

Brain Stem Axial View

Brain Stem (*inferior* → *superior*)

A. Medulla oblongata

B. Pons

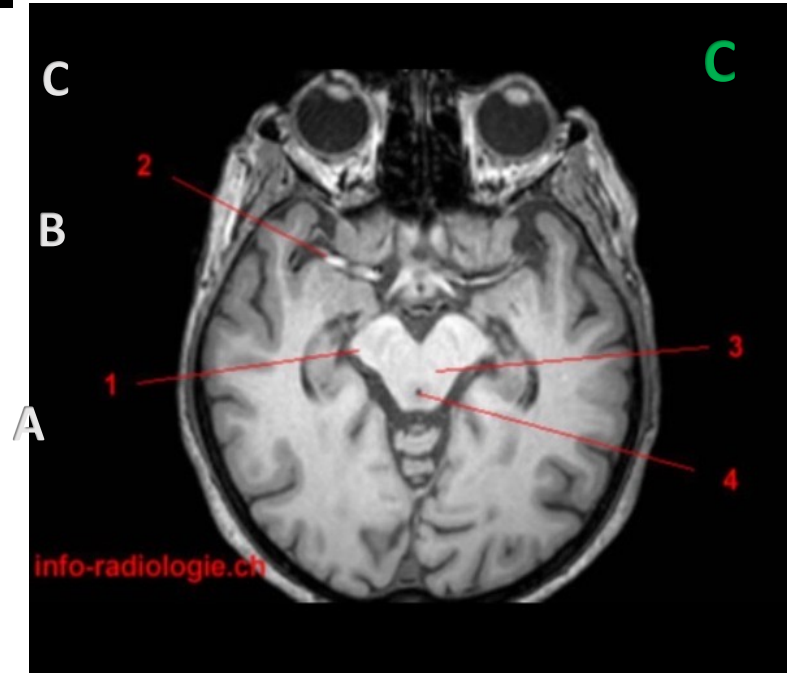
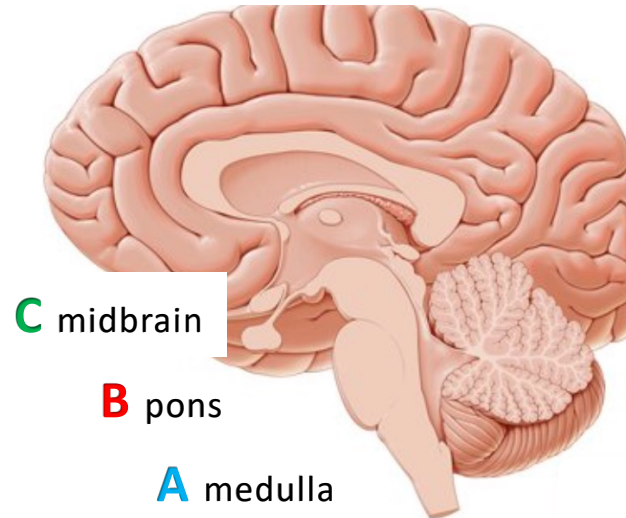
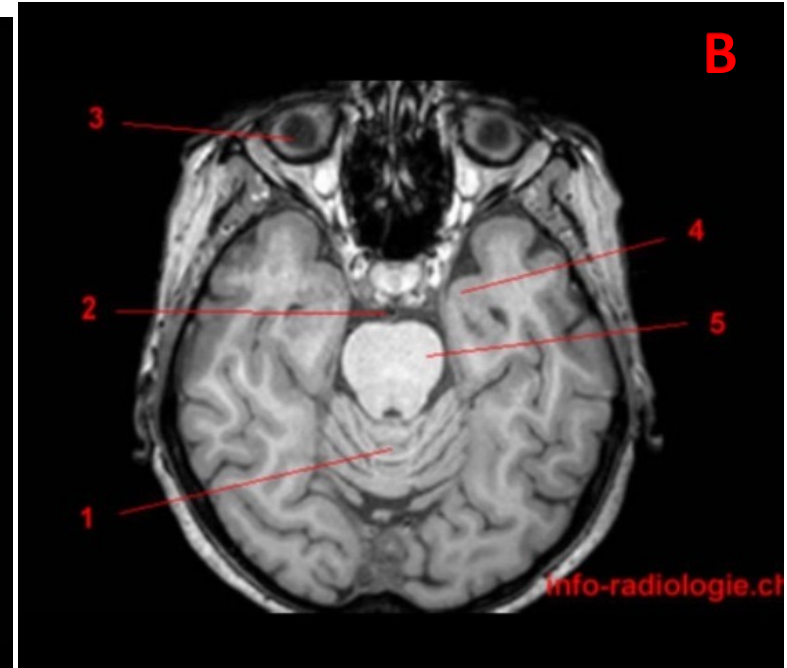
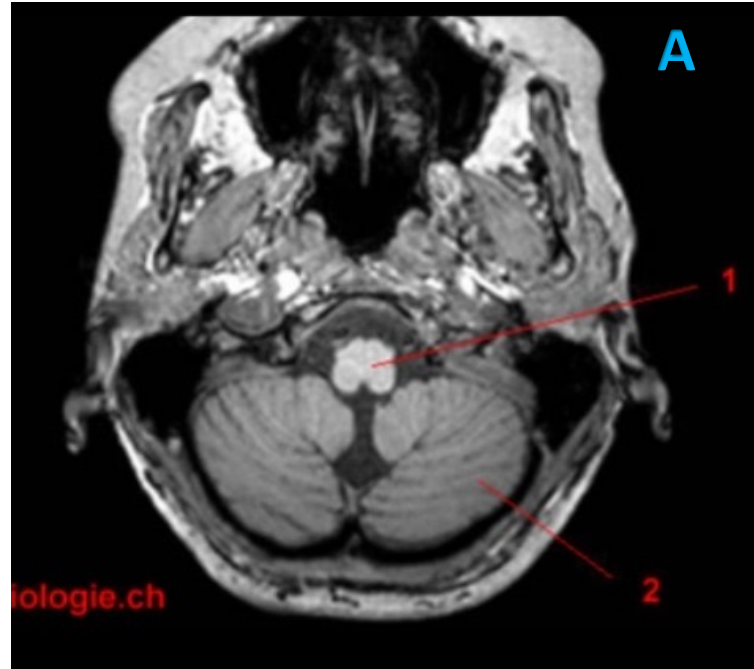
C. Midbrain (note: cerebral crus)

Cerebellum

Temporal lobes

Parietal lobes:

- At the level of the **medulla**, look at the **cerebellum**.
- At the level of the **Pons**, look at the **Poles (temporal and occipital)**.
- At the level of the **midbrain**, look at **hippocampi** and the **temporal horns**.



MRI Hippocampi - Axial View

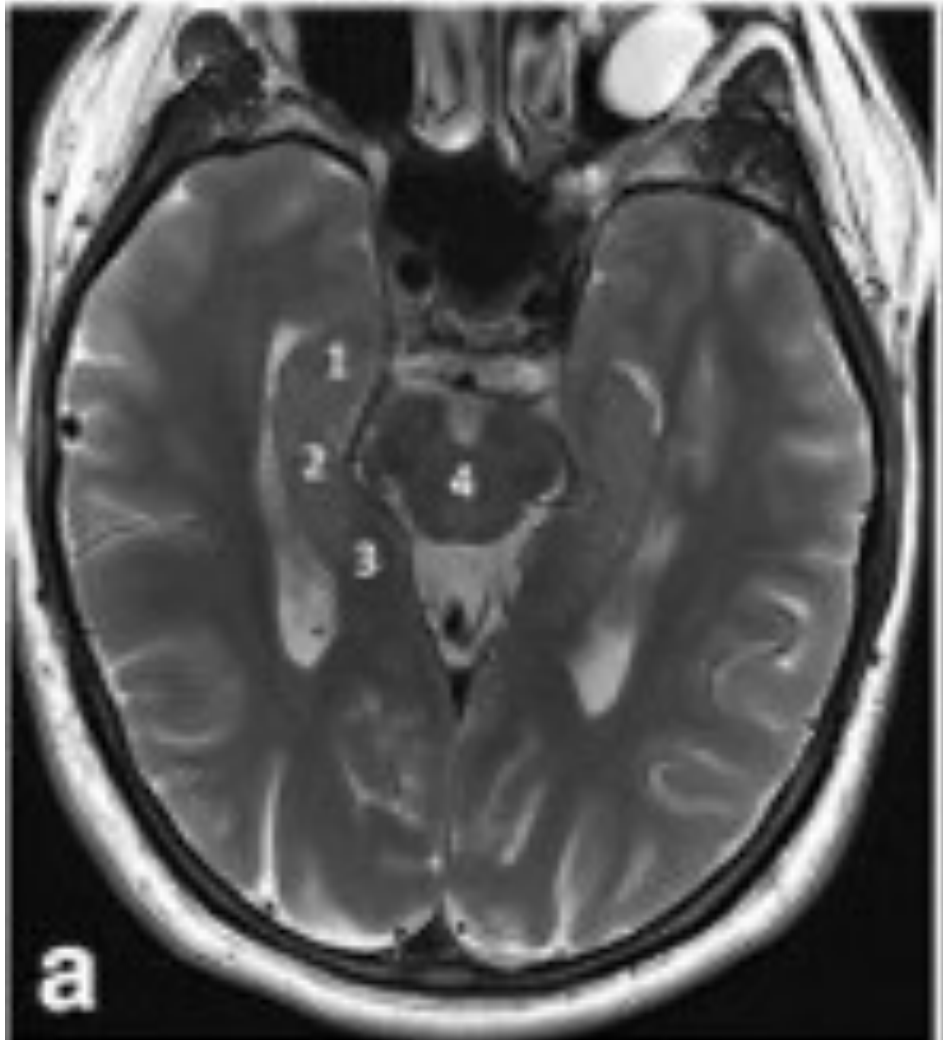


Image Ref: Dekeyzer, et al. 2017

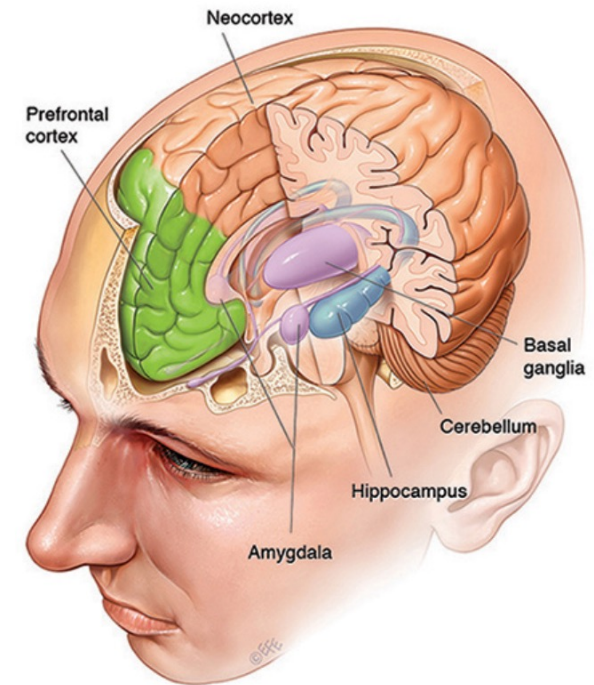


Image: <https://qbi.uq.edu.au/brain-basics/memory/where-are-memories-stored>

Hippocampus:

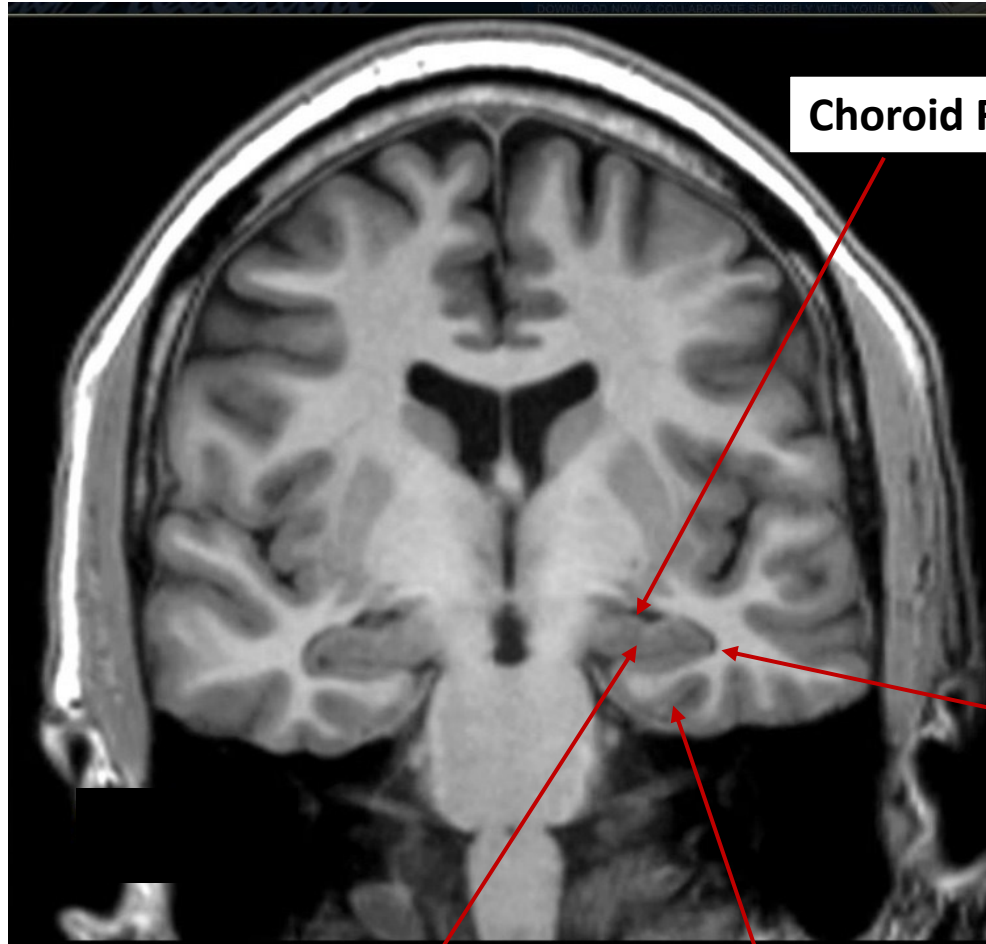
1 = head is located anterior to the mesencephalon (mid-brain)

2 = body is at the level of the mesencephalon

3 = tail is posterior to the mesencephalon

4 = midbrain (note the cerebral crus)

MRI Hippocampi - Coronal View



Choroid Fissure

Hippocampus

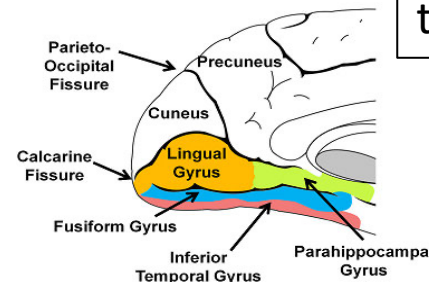
Collateral Sulcus

Temporal Horn
(not able to be appreciated)

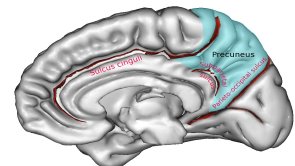
Hippocampal Atrophy:

1. Widening of the choroid fissure
2. Widening of the temporal horn
3. Widening of the collateral sulcus
4. Decreased height of hippocampal formation

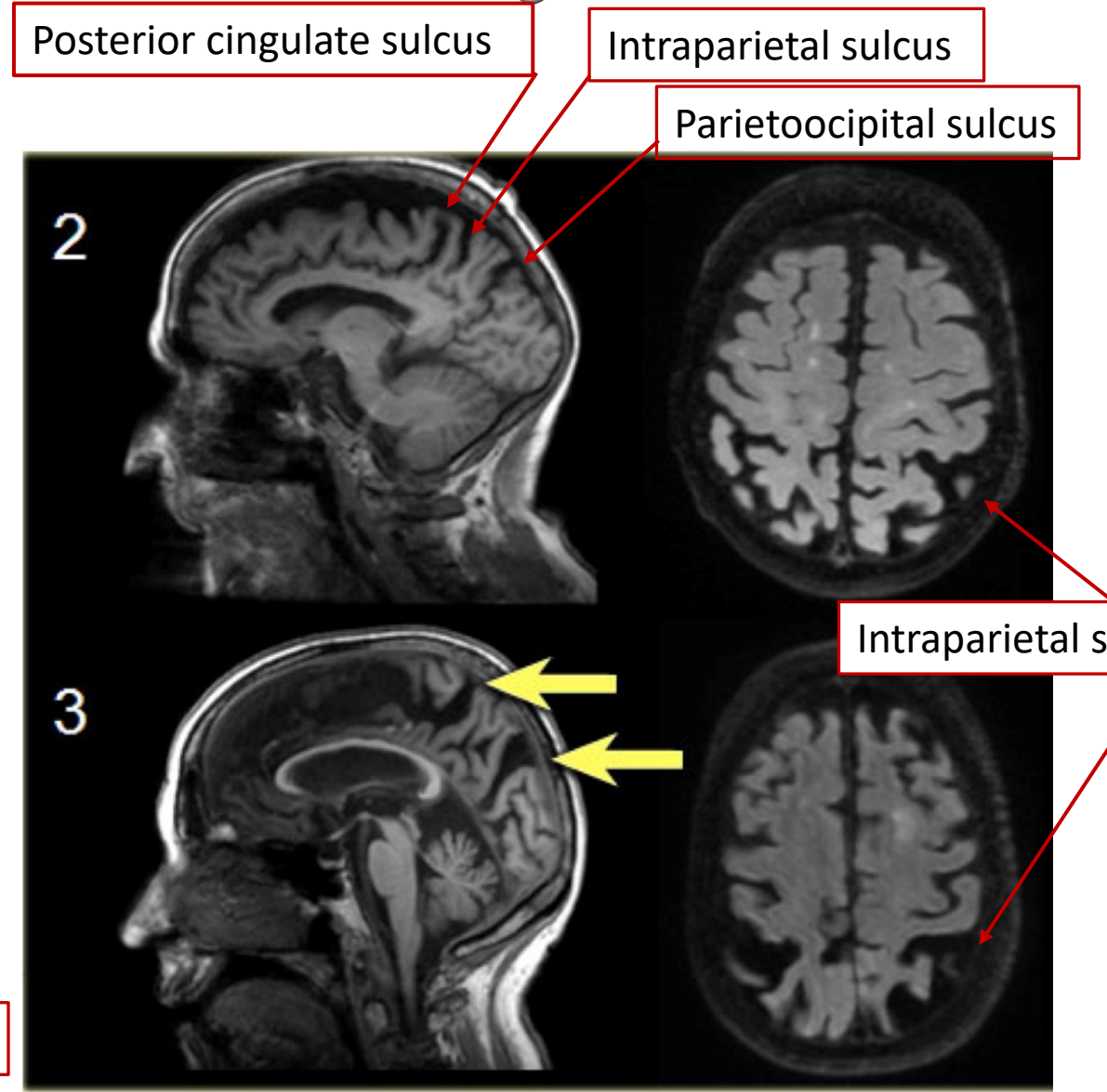
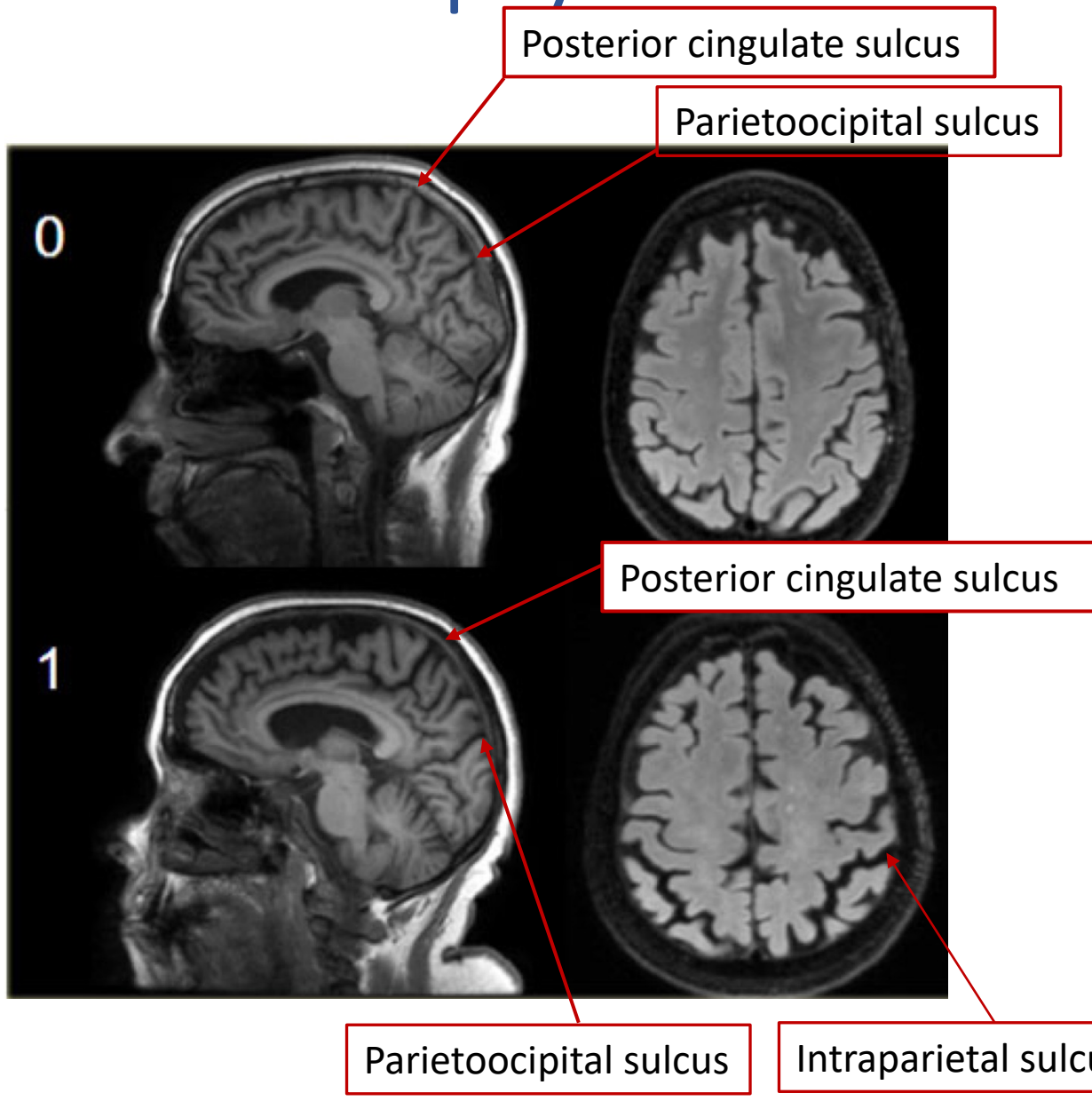
Choroid fissure: a cleft that forms as the height of the hippocampal formation decreases. Widening of this cleft is a very early sign of hippocampal atrophy.



Parietal Atrophy

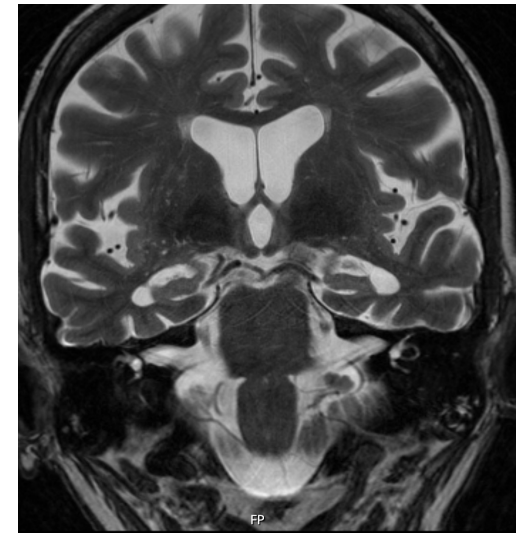
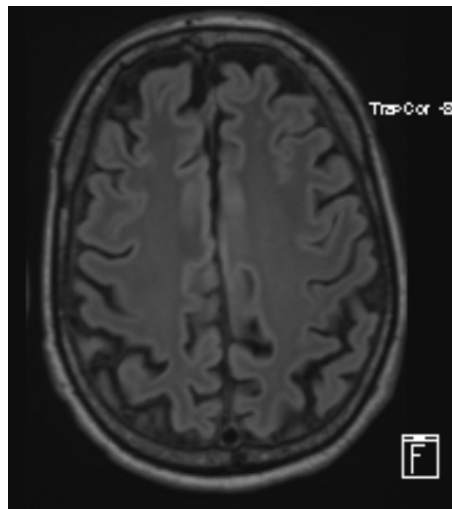
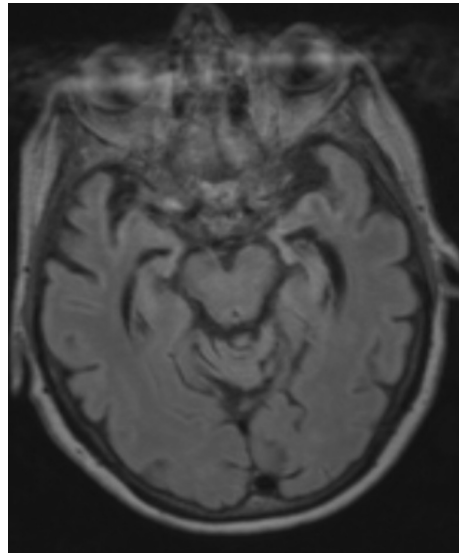
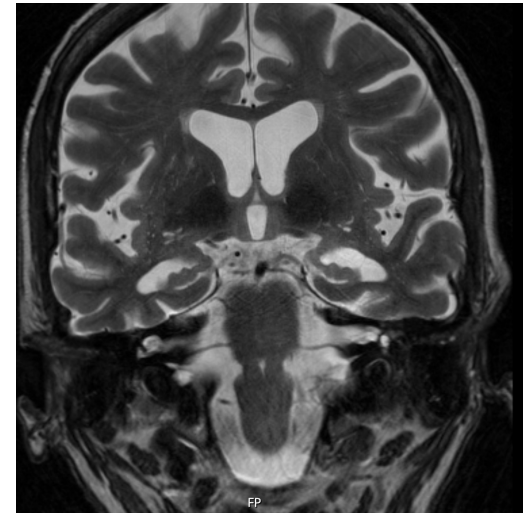
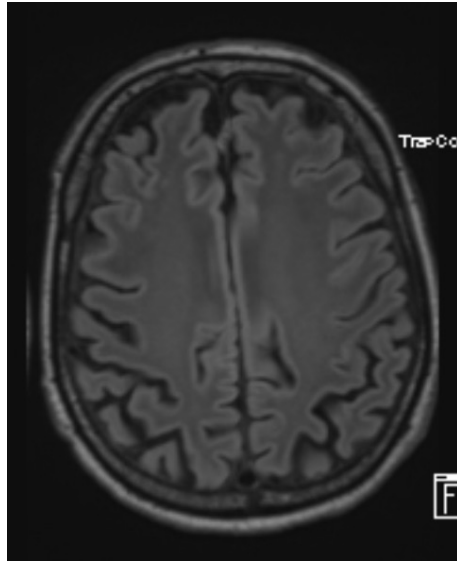
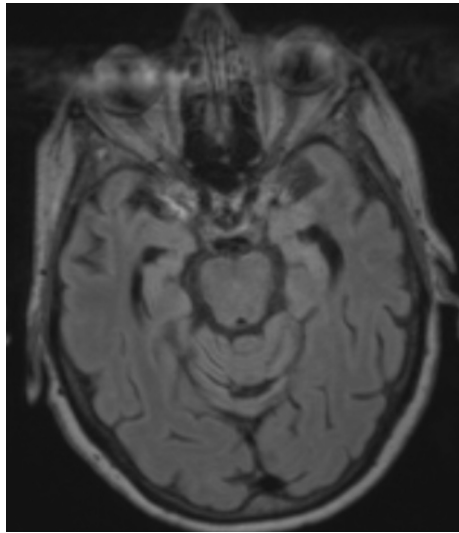


Precuneus

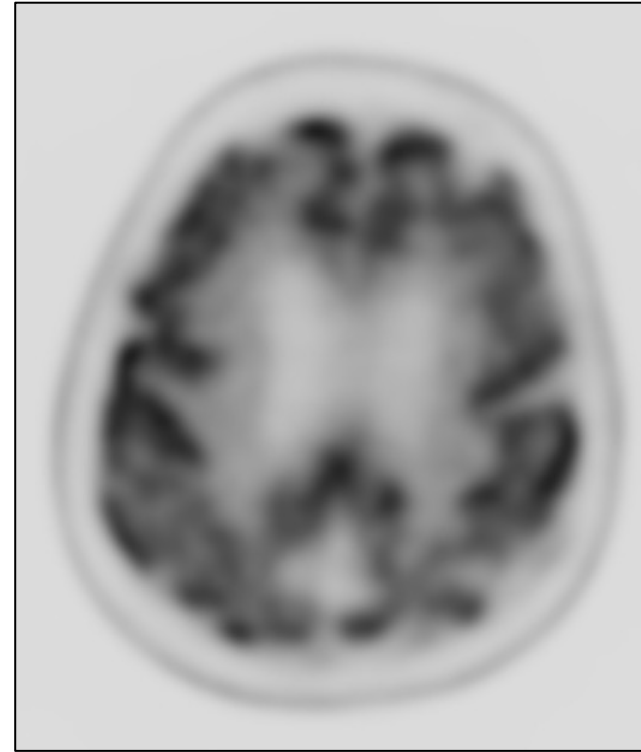
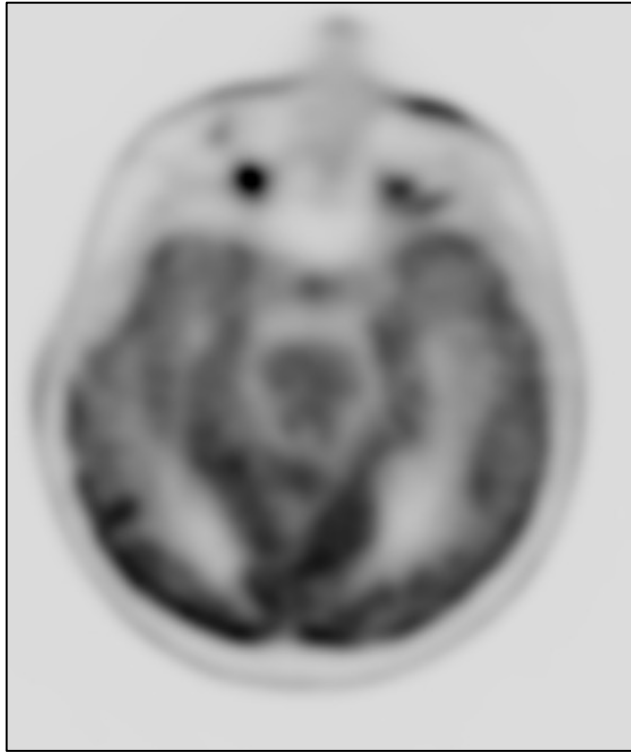


REF: <http://www.radiologyassistant.nl/en/p43dbf6d16f98d/dementia-role-of-mri.html>

Clinical Vignette 2 - MRI (75 y/o M)



Clinical Vignette 2 - FDG PET



Hypometabolism b/l temporal lobes L>R, biparietal hypometabolism L>R. Posterior cingulate gyrus is involved (agree, hard to appreciate on this slice)

FDG = fluorodeoxyglucose F 18- a glucose analog tagged w/ a radiotracer.- uptake in this image is black.

Clinical Vignette 2 – Diagnosis

- 1. Medial Temporo-Limbic Network: memory and learning**
 - ✓ **MCI with AD etiology** (*Why not Alzheimer's Dementia?*)
 - **MRI:** MTL (ie: hippocampal/parahippocampal gyri), posterior parietal cortical atrophy. **SWI/GRE-microhemorrhages/superficial siderosis.**
 - **FDG PET:** hypometabolism in same areas.
2. Occipito-Temporal /Occipito-Parietal Network: vision and object recognition
3. Fronto-Temporal Network: executive: attention, behavior.
4. Perisylvian Language Network: PPAs- language.

Microhemorrhages

Two types of MR Imaging:

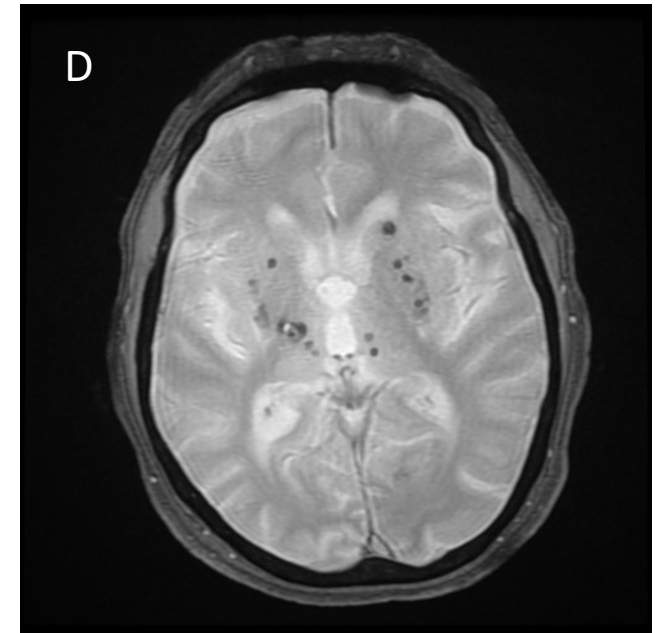
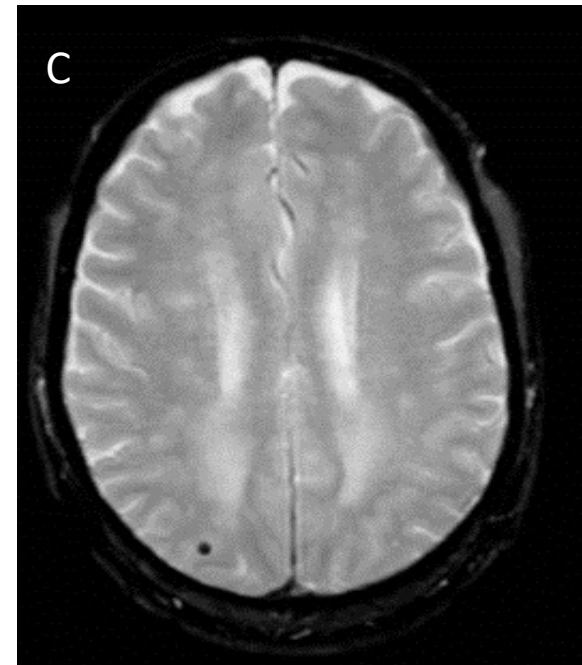
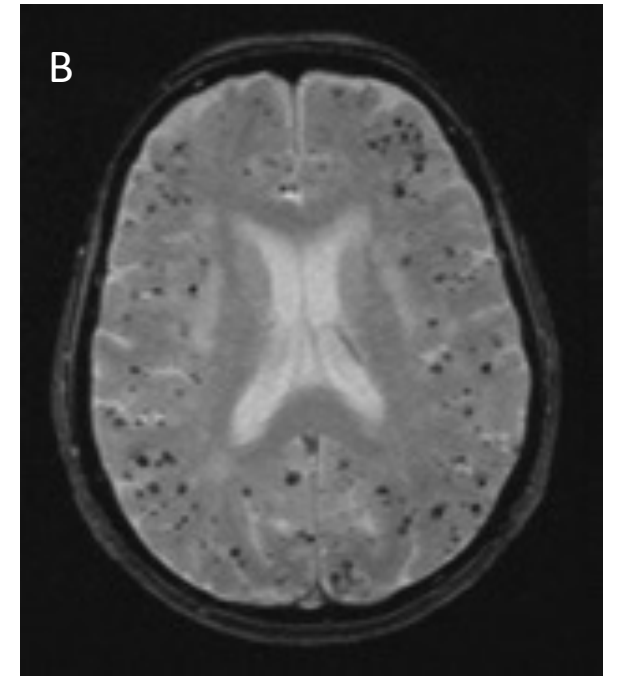
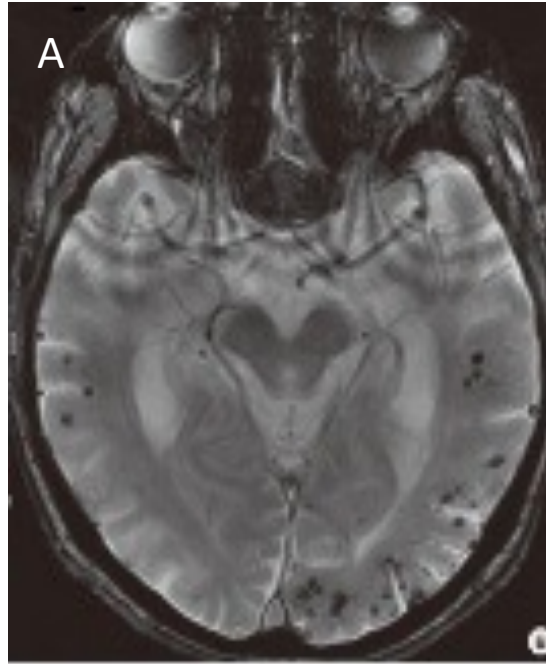
1. **SWI:** Susceptibility Weighted Imaging
2. **GRE:** Gradient (Recalled) Echo Imaging

Images A, B, C:

- **Cerebral amyloid angiopathy (CAA):** microhemorrhages in the **peripheral cortical distribution**, associated with **Alzheimer's disease**.

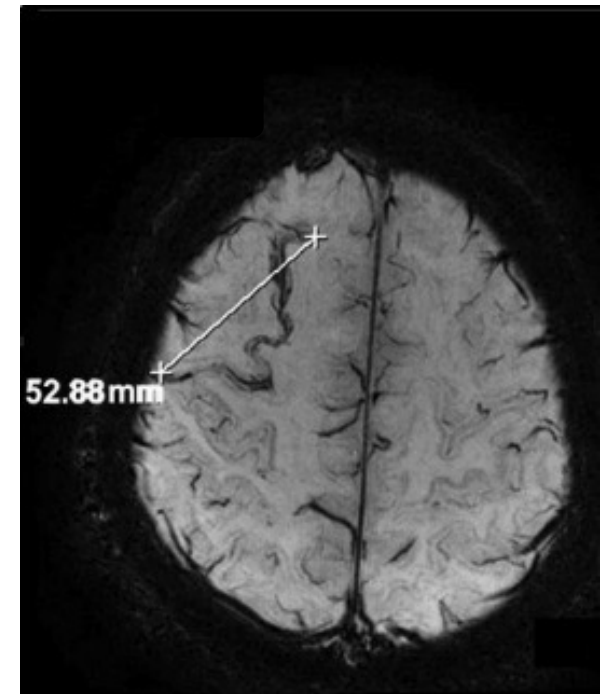
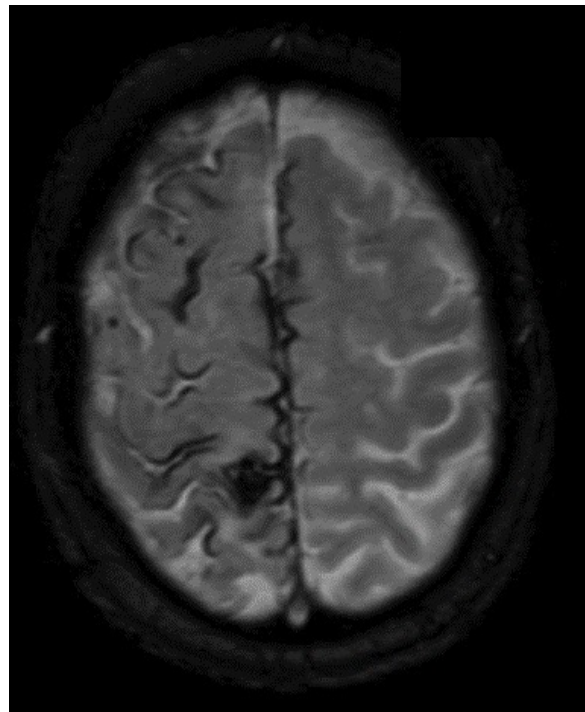
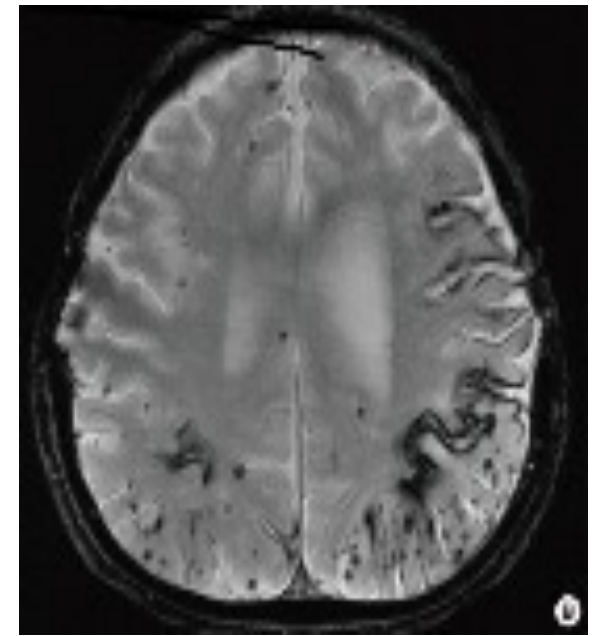
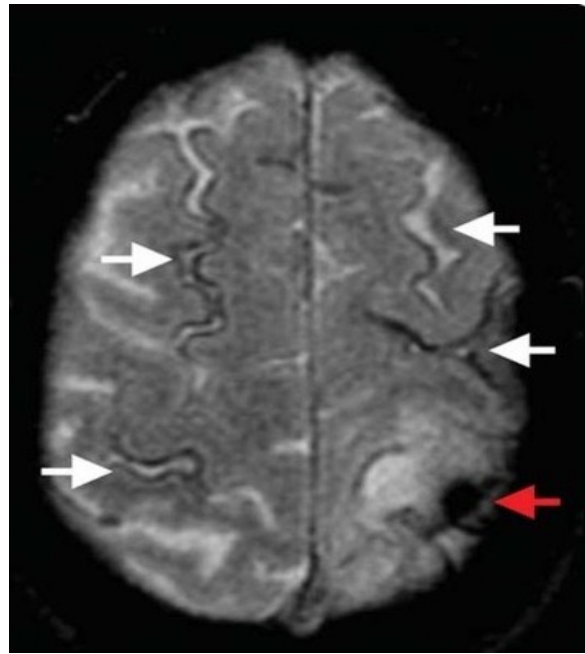
Image D:

- **Hypertensive microangiopathy:** microhemorrhages in the **basal ganglia, pons and cerebellar hemispheres**, associated with **chronic HTN**.



Superficial Siderosis

- **GRE** or **SWI** sequences will show a **serpentine pattern** of **blood deposits** within **sulci**.
- **Superficial hemorrhage** within the **subarachnoid** and/or **subpial space**.
- Ask about falls, possibility of **SAH** not completely resolved.
- May often be associated with **cerebral amyloid angiopathy**.



Clinical Vignette 3

Clinical Vignette 3 - History

A 56 y/o F presented with a “personality change”, which began about 4 yrs ago. She was a emergency RN x 30 yrs. She recently had an **extramarital affair w/ a male patient** whom she treated for a dislocated finger, whom she found “irresistible”, which resulted in her termination.

1. **Medial Temporo-Limbic Network:** memory and learning
2. **Occipito-Temporal /Occipito-Parietal Network:** vision and object recognition
3. **Fronto-Temporal Network:** executive, attention, behavior
4. **Perisylvian Language Network:** language

Per her husband,

- She openly **criticized her dgt-in-law for being overweight**, and told her **husband to “shut-up”** when they were out to dinner with friends.
- She has become **preoccupied with Starbucks Cold Brews**, consuming three to four large beverages per day.
- Her husband recently discovered she **spent \$5,000 on Amazon** in last three mos, on toilet paper, paper towels, and cleaning supplies, which she has been stock-piling in their basement.
- She refused to go to her sons’ **basketball games**, explaining that she has always hated sports, and she has never really enjoyed their games anyway.
- She does not seem to have any problem recalling recent events, cooking, driving or shopping. She manages her own meds and apts well.

Zoom Pole: Clinical Vignette 3 - Ddx

1. Which of the four main functional cognitive systems is most affected in this patient?

a) Choose from box on R →

2. What would be your top differential diagnoses?

(you may choose one or more than one)

- a) Behavioral Variant Alzheimer's Dz
- b) Behavioral Variant FTD
- c) Logopenic Variant PPA
- d) Semantic Variant PPA
- e) Dementia of Lewy Body

- 1. Medial Temporo-Limbic Network:**
memory and learning
- 2. Occipito-Temporal /Occipito-Parietal Network:** vision and object recognition
- 3. Fronto-Temporal Network:**
executive, attention, behavior
- 4. Perisylvian Language Network:**
language

Clinical Vignette 3 – Diagnosis

1. **Medial Temporo-Limbic Network:** memory and learning
2. **Occipito-Temporal /Occipito-Parietal Network:** vision and object recognition
3. **Perisylvian Language Network:** PPAs- language-primary and prominent sx
4. **Fronto-Temporal Network:** executive, attention, behavior
 - ✓ Behavior Variant of Alzheimer's Disease
 - ✓ **Behavioral Variant of Frontotemporal Dementia (bvFTD)**
 - Cognitive testing with impairment in **attention** and **executive domains** (localizes to **frontal lobe**). Memory often spared until neurodegeneration is advanced.
 - **Often a Clinical Dx.**
 - **MRI** with **fronto** and/or **anterior temporal atrophy** (**imaging often not necessary**)
 - **FDG PET:** hypometabolism in corresponding areas

bvFTD Clinical Diagnostic Criteria

Possible Behavioral Variant Frontotemporal Dementia (bvFTD)

Three of the following as persistent or recurrent features:

- A** Early behavioral disinhibition
- B** Early apathy or inertia
- C** Early loss of sympathy or empathy
- D** Early perseverative, stereotyped, or compulsive/ritualistic behavior
- E** Hyperorality and dietary changes
- F** Neuropsychological profile: executive/generation deficits with relative sparing of memory and visuospatial functions

Probable bvFTD

All of the following:

- A** Meets criteria for possible bvFTD
- B** Exhibits significant functional decline (by caregiver report, Clinical Dementia Rating, or Functional Activities Questionnaire)
- C** Imaging results consistent with bvFTD:
 - C1** Frontal and/or anterior temporal atrophy on MRI or CT
 - C2** Frontal and/or anterior temporal hypoperfusion or hypometabolism on PET or SPECT

Review of Pertinent Anatomy for Imaging

Frontotemporal Atrophy

Image A/B:

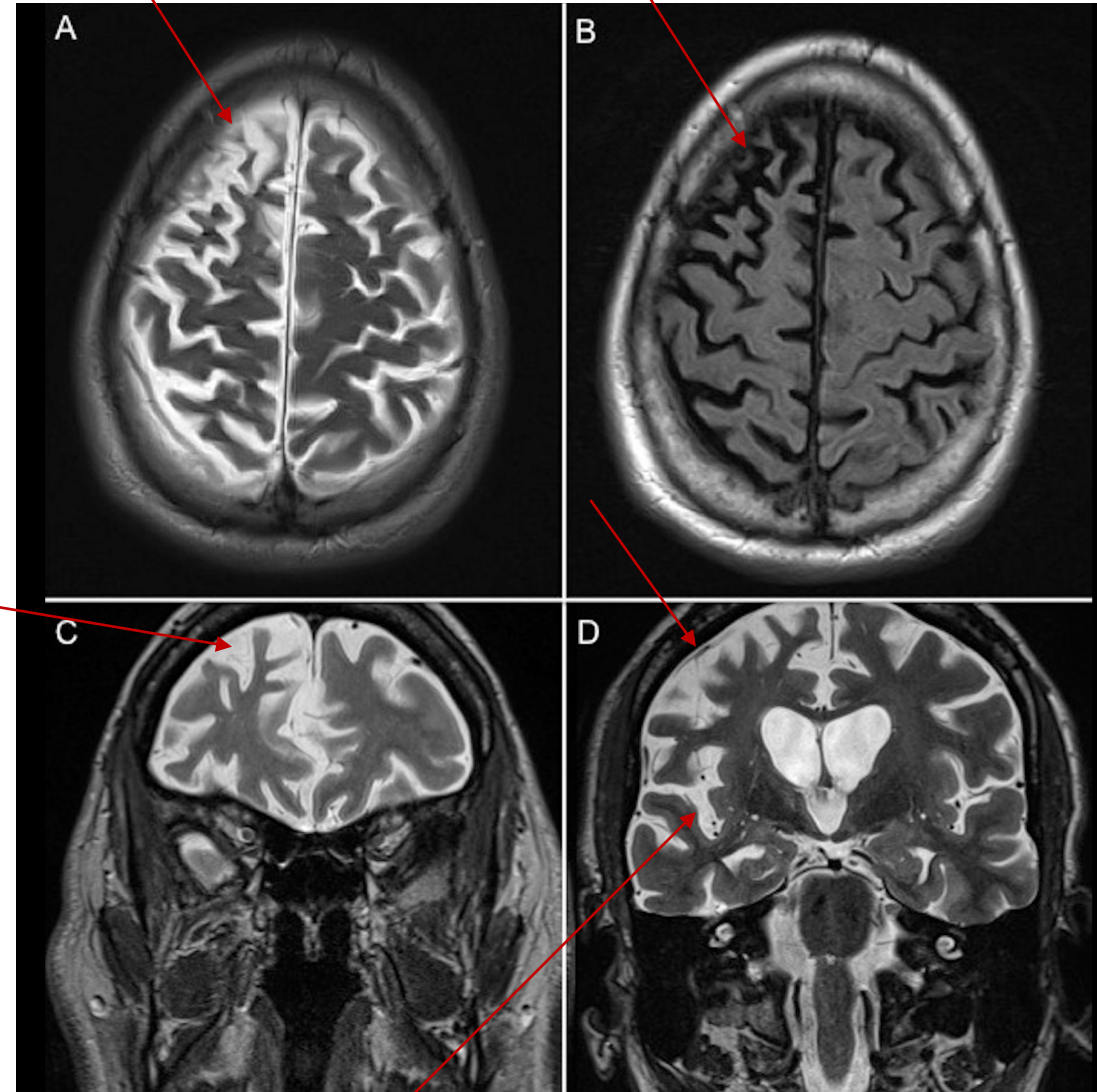
- Axial T2/Axial FLAIR with **R frontal lobe atrophy.**

Image C:

- Coronal T2 also showing the **R frontal lobe atrophy.**

Image D:

- Coronal T2 showing the **R frontotemporal atrophy.**
- Note the **widening** of the **R Sylvian fissure.**
- Note the **widening** of the **sulci** b/t the **superior/middle and inferior temporal gyri.**
- Note **hippocampal atrophy R>L.**



Clinical Vignette 4

Clinical Vignette 4- History

A 69 y/o M presents with “**memory problems**” x 1 yr. PMH is notable for HTN, HLD, cholecystectomy one yr ago. Ed = 19 yrs. JD, part owner of cooperate law firm. Retired age 63, no memory problems.

Per his wife,

- Prob are due to **anesthesia** received during removal of his gallbladder. Prolonged **post-op delirium**.
- Since his surgery, he can no longer manage his own **meds, apts** or **finances**.
- Some days he seems to be his “**old self**”. Whereas, other days, he is **very confused**, and becomes **agitated** and **easily angry**. Prior, his personality was very easy-going.
- He never helped w/ cooking, cleaning, or laundry.
- Has gotten **lost driving** on **several occasions** in familiar areas, eg: country club, and dgts home.
- Sees **children playing in the house at night**, and on two occasions **thought is wife was a “friend”**.
- He **talks in his sleep** and **flails his arms** around. Has **hit his wife** on a three occasions.
- He is less balanced w/ walking, has had **two falls** in the last 3 mos. No shuffle. No tremors.

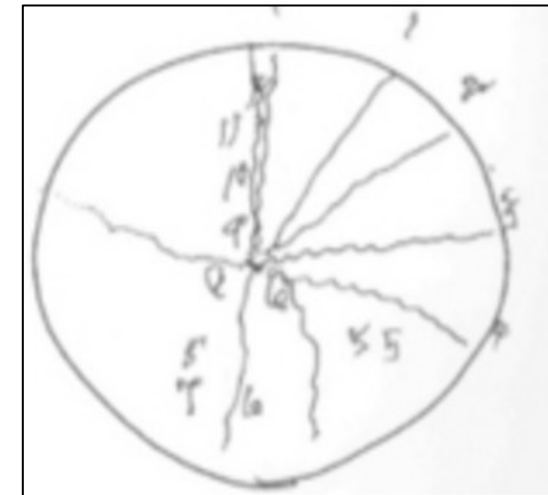
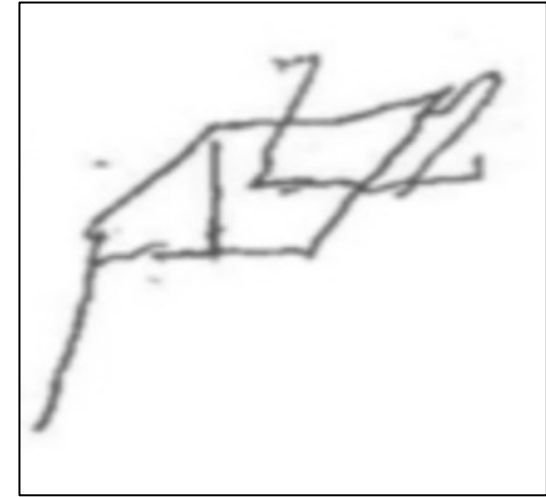
1. **Medial Temporo-Limbic Network:**
memory and learning
2. **Occipito-Temporal /Occipito-Parietal Network:** vision and object recognition
3. **Fronto-Temporal Network:** executive, attention, behavior
4. **Perisylvian Language Network:**
language

Clinical Vignette 4 - Testing

Exam and NP testing

- MoCA = 14/30. He lost points for **cube, clock, and trails**. Also, lost points for **digits, naming, and abstraction**, and delayed recall 3/5.
- Craft Story recall = 5 (**memory impaired**)
- F words = 7 (phonemic fluency); animals = 13 (semantic fluency) (**language impaired- phonemic > semantic**)
- Digits forward =4, backwards =2 (**attention impaired**)
- Trails A time was below > 1.5 SD below nl for age and ed.
- He timed out on Trails B (**executive impaired**)
- Clock and Benson Figure shown to R (**visuospatial impaired**)

Neurological exam was notable for **UE cogwheeling R>L**. **Gait was bradykinetic, slightly hunched, reduced R arm swing**. Stride length and base width were nl, w/ no shuffling. (**+ Parkinsonism**)



Zoom Pole: Clinical Vignette 4 - Ddx

1. Which of the four main functional cognitive systems is most affected in this patient?

a) Choose from box on R →

2. What would be your top differential diagnoses?

(you may choose one or more than one)

- a) Behavioral Variant Alzheimer's Dz
- b) Behavioral Variant FTD
- c) Logopenic Variant PPA
- d) Semantic Variant PPA
- e) Dementia of Lewy Body

- 1. Medial Temporo-Limbic Network:**
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- 2. Occipito-Temporal /Occipito-Parietal Network:** vision and object recognition
- 3. Fronto-Temporal Network:**
executive, attention, behavior
- 4. Perisylvian Language Network:**
language

4th Consensus Criteria for Clinical Dx of Dementia of Lewy Bodies

Required Criterion

- ◆ Dementia, often with early and prominent deficits in attention, executive function, and visuo-perceptual ability; prominent or persistent memory impairment tends to occur with progression.

Probable Dementia With Lewy Bodies

- ◆ Presence of two or more core clinical features (with or without indicative biomarker)
- ◆ One core clinical feature plus at least one indicative biomarker

Possible Dementia With Lewy Bodies

- ◆ Presence of one core clinical feature (no indicative biomarker)
- ◆ Presence of one or more indicative biomarkers but no core clinical features

Core Clinical Features

- ◆ Fluctuating cognition with pronounced variations in attention and alertness
- ◆ Recurrent visual hallucinations
- ◆ Rapid eye movement (REM) sleep behavior disorder (may precede other symptoms)
- ◆ Parkinsonism (defined as one or more spontaneous cardinal features: bradykinesia, rest tremor, rigidity)^b

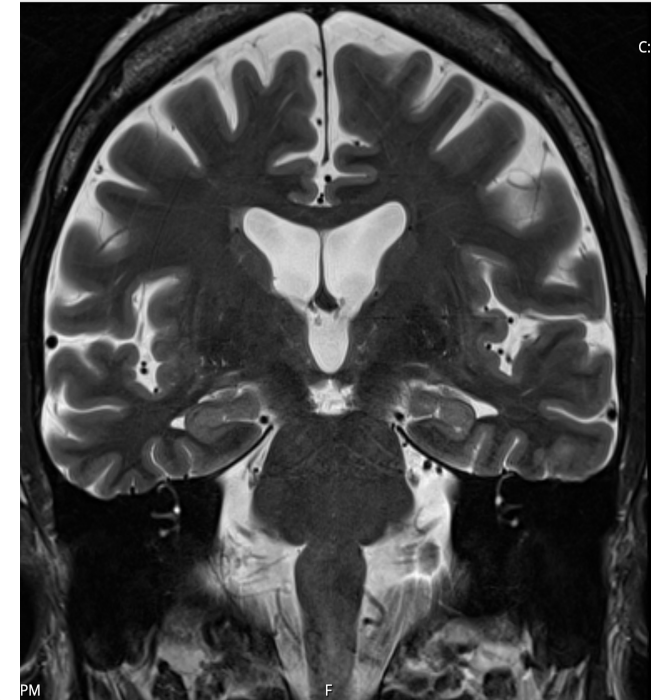
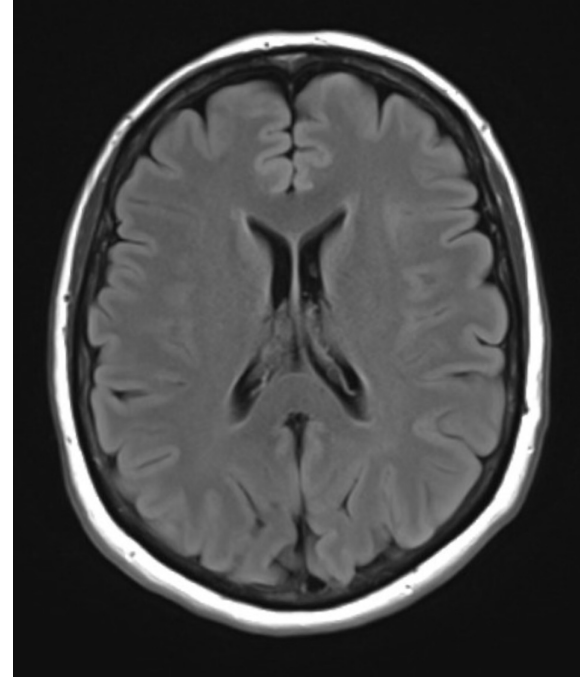
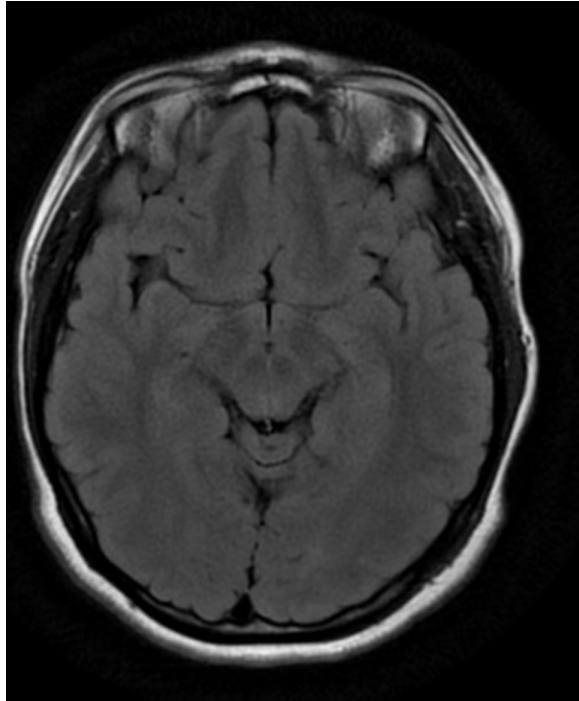
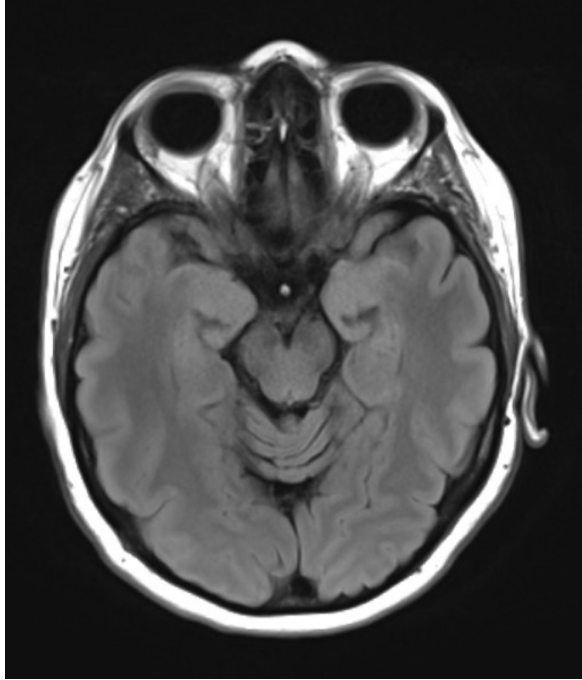
Supportive Clinical Features

- ◆ Severe sensitivity to antipsychotic agents
- ◆ Postural instability
- ◆ Repeated falls
- ◆ Syncope or other transient episodes of unresponsiveness
- ◆ Severe autonomic dysfunction (eg, constipation, orthostatic hypotension, urinary incontinence)
- ◆ Hypersomnia/excessive daytime sleepiness
- ◆ Hyposmia
- ◆ Hallucinations in nonvisual modalities
- ◆ Systematized delusions
- ◆ Apathy, anxiety, and depression

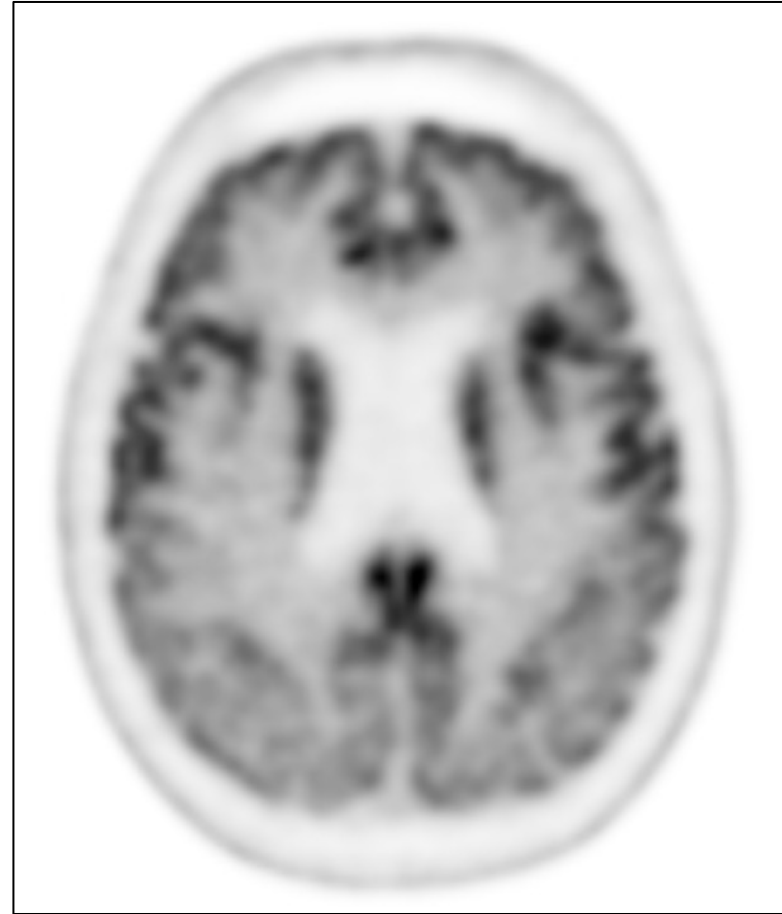
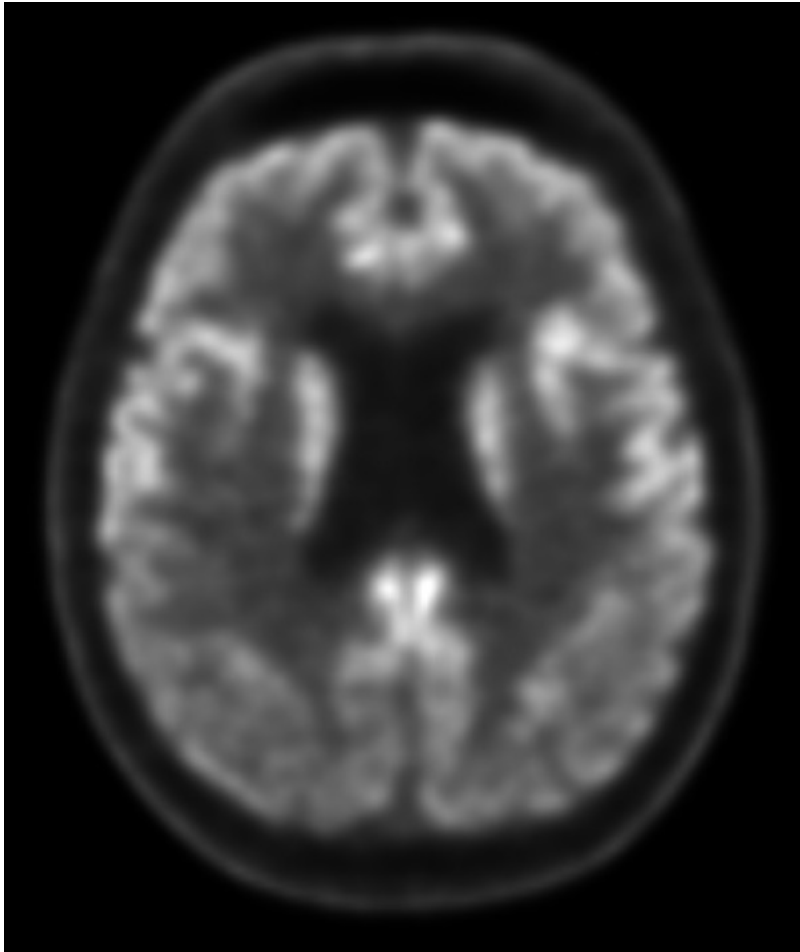
Four *Functional* Cognitive Systems

1. **Medial Temporo-Limbic Network:** memory and learning
 - ✓ Alzheimer's Disease and MCI with AD etiology
2. **Occipito-Temporal /Occipito-Parietal Network:** vision and object recognition
 - ✓ Dementia of Lewy Bodies (DLB)
 - **MRI:** often normal. May have occipito-parietal atrophy (**posterior cingulate gyrus spared**)
 - ✓ Posterior Cortical Atrophy (PCA)
 - **MRI:** parieto-occipito or occipito-temporal atrophy (**posterior cingulate gyrus involved**)
3. **Front-Temporal Network:** executive, attention, behavior
 - ✓ Behavioral Variant of Frontotemporal Dementia (bvFTD).
 - ✓ Behavior Variant of Alzheimer's Disease
4. **Perisylvian Language Network:** language [primary presenting problem, most debilitating problem]
 - ✓ Primary Progressive Aphasia- Logopenic (lvPPA)
 - ✓ Primary Progressive Aphasia- Semantic (svPPA)
 - ✓ Primary Progressive Aphasia- Agrammatic/Non-fluent (nfvPPA)
 - *Covered in Primary Progressive Aphasia lecture

Clinical Vignette 4- MRI



Clinical Vignette 4 – FDG PET



FDG PET: hypometabolism posterior parietal (and occipital lobe- not shown well on this slice)
Note the ***Cingulate Island Sign*** (preserved cingulate gyrus)

Clinical Vignette 4 – Diagnosis

1. Medial Temporo-Limbic Network: memory and learning
2. Occipito-Temporal /Occipito-Parietal Network: **vision and object recognition**
 - ✓ Posterior Cortical Atrophy (PCA)- most often a variant of AD
 - MRI: predominant occipito-parietal/occipito-temporal atrophy (posterior cingulate *involved*)
 - ✓ **Dementia of Lewy Bodies (DLB)**
 - MRI: **often normal** or may have occipito-parietal atrophy (posterior cingulate gyrus will be *spared*)
 - **FDG PET**: hypometabolism in corresponding areas (DLB w/ “*cingulate Island*” sign)
3. Fronto-Temporal Network: **executive, attention**, behavior (*DLB will have prominent exec/atten deficits)
4. Perisylvian Language Network: PPAs- language

In Summary: Four *Functional* Cognitive Systems - Imaging

- 1. Medial Temporo-Limbic Network: memory and learning**
 - ✓ Alzheimer's Disease and MCI with AD etiology
 - **MRI:** MTL, posterior parietal cortical atrophy. SWI/GRE-microhemorrhages/superficial siderosis.
- 2. Occipito-Temporal /Occipito-Parietal Network: vision and object recognition**
 - ✓ Posterior Cortical Atrophy (PCA)
 - **MRI:** parieto-occipito or occipito-temporal atrophy (**posterior cingulate gyrus involved**)
 - ✓ Dementia of Lewy Bodies (DLB)
 - **MRI:** often normal. May have occipito-parietal atrophy (**posterior cingulate gyrus spared**)
- 3. Front-Temporal Network: executive, attention, behavior (*DLB will have prominent exec/atten deficits)**
 - ✓ Behavioral Variant Alzheimer's Disease
 - **MRI:** fronto- temporal atrophy. Imaging helps- microhemorrhages on SWI/GRE lends weight.
 - ✓ Behavioral Variant of Frontotemporal Dementia (bvFTD).
 - **MRI:** fronto and/or anterior temporal atrophy. Imaging often not necessary for bvFTD.
- 4. Perisylvian Language Network: language- primary and prominent sx**
 - ✓ Primary Progressive Aphasia- Logopenic (lvPPA)
 - ✓ Primary Progressive Aphasia- Semantic (svPPA)
 - ✓ Primary Progressive Aphasia- Agrammatic/Non-fluent (nfvPPA)
 - *MRIs: are different for different variants- covered in PPA Lecture – Covered in next APP2APP lecture!**

References

1. Armstrong, Melissa, J. MD, MSc, FAAN. Lewy Body Dementia. CONTINUUM. DEMENTIA p. 128-146. February 2019, Vol. 25, No 1.
2. Beh SC, Muthusamy B, Calabresi P, *et al.* Hiding in plain sight: a closer look at posterior cortical atrophy. *Practical Neurology* 2015;**15**:5-13. <https://pn.bmj.com/content/15/1/5>
3. Budson, Andrew E., Solomon, Paul, R. Memory Loss, Alzheimer's Disease, and Dementia E-Book . Elsevier Health Sciences. Kindle Edition
4. Botha, Hugo, MBChB; Keith A. Josephs, MD, MST, MSc. Primary Progressive Aphasia and Apraxia of Speech. CONTINUUM. Dementia p. 101-127. February 2019, Vol.25, No.1
5. Dekeyser, DeKock, et al. “Unforgettable” – a pictorial essay on anatomy and pathology of the hippocampus. *Insights Imaging* (2017) 8:122-212.
6. Imaios: Online Radiology Reference <https://www.imaios.com/en/e-Anatomy/Head-and-Neck/Brain-MRI-3D>
7. Martinez de Souza, Ricardo Krause, et al. A patient with posterior cortical atrophy due to Alzheimer’s disease. *Dement Neuropsychol* 2018 September;**12** (3):326-328. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6200153/>
8. McKeith, Ian, et al. Diagnosis and management of dementia with Lewy bodies. Fourth consensus report of DLB Consortium. *Neurology* 89, July 4, 2017. <https://n.neurology.org/content/neurology/89/1/88.full.pdf>
9. Quach, C. Hommet, C., et al. “Early-onset dementias: Specific etiologies and contribution of MRI. *Diagnostic and Interventional Imaging* (2014) 95, 377-398.
10. Rabinovici, Gil D. MD. Late-onset Alzheimer Disease. CONTINUUM. Dementia p. 14-33. February 2019, Vol.25, No.1.
11. Radiology Assistant: free radiology reference: <http://www.radiologyassistant.nl/en/p43dbf6d16f98d/dementia-role-of-mri.html>
12. Radiopaedia: Online Radiology Reference: <https://radiopaedia.org/?lang=us>
13. Schott, Jonathan M. , MD, FRCP, FEAN, SFHEA; Crutch, Sebastian J. PhD, Cpsych. Posterior Cortical Atrophy. CONTINUUM. Dementia p. 52-75. February 2019. Vol. 25, No 1.
14. William W. Seeley, MD, Behavioral Variant Frontotemporal Dementia. CONTINUUM, Dementia p. 76-100 February 2019, Vol.25, No.1.

Questions?



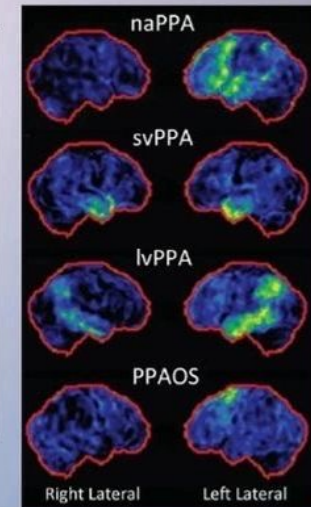
<https://app2app.org/>

DATE: August 18, 2021 @ 6:30 PM EST

PRIMARY PROGRESSIVE APHASIA DIAGNOSIS & BEDSIDE TESTING

This lecture will help you recognize the root criteria for the different variants of PPAs, ie: lvPPA, svPPA and nfPPA.

You will learn how to optimize bedside testing skills to help you differentiate between the three variants. You will also learn how to correlate the neuropathological and imaging features associated with each.



APP2APP Virtual Lectures

Image ref: Published in Seminars in neurology 2013
Primary progressive aphasia and apraxia of speech, Y. Jung, J. Duffy, K. Josephs

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