Primary Progressive Aphasia: Diagnosis & Bedside Testing

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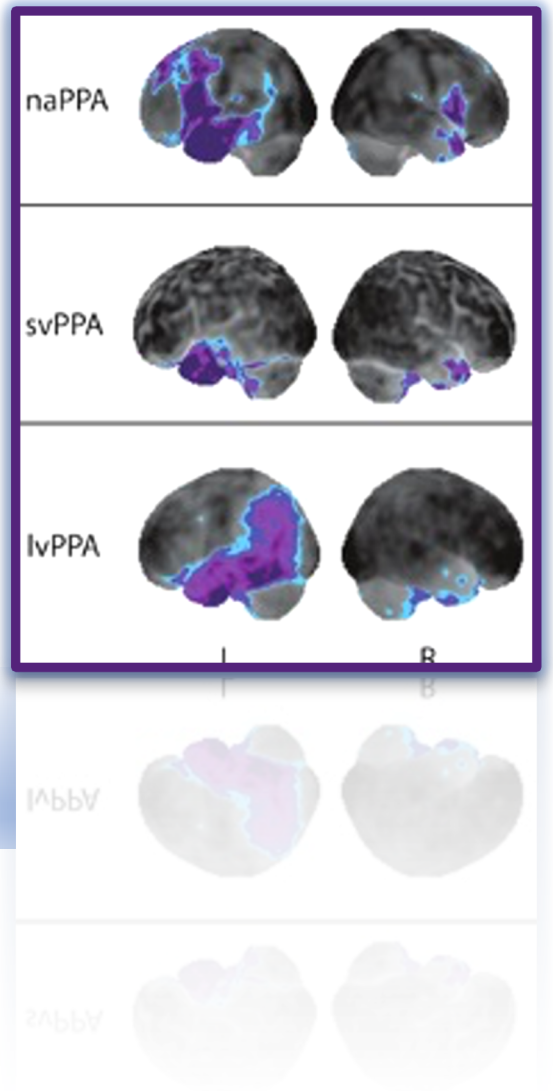

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Objectives

1. Correctly Diagnose Primary Progressive Aphasia (PPA)
   - Recognize the root criteria for PPA diagnosis
   - Recognize the criteria for the different variants of PPAs, ie: **lvPPA, svPPA, nfPPA**

2. Optimize Bedside Testing to help differentiate between the three variants.

3. Correlate neuropathological and imaging features associated with each.

Diagnosing Primary Progressive Aphasia

Primary Progressive Aphasia:

- A group of **neurodegenerative** diseases characterized by **prominent language impairment** that occurs at the **onset** of the disease and **during the initial phase**.
- At onset the patient will have a relative **absence** of **cognitive**, **behavioral** and/or **motor disturbance**.

Two **step process** in identifying PPA's correctly:

1. Recognize the **root criteria** for PPA diagnosis.
2. Recognize the **criteria** for the **different variants** of PPAs
   - **Logopenic PPA (lvPPA)**
   - **Semantic PPA (svPPA)**
   - **Non-fluent/agrammatic PPA (nfPPA)**

Root Criteria: Primary Progressive Aphasia

- **Primary**: language is the **most prominent sx**, it was the **"primary"** (first) symptom to occurred.
- **Progressive:** language deficit is **"progressive"**, reflecting underlying **neurodegenerative** etiology.
- **Aphasia**: patient must have **"aphasia"**, ie: impaired **usage** or **comprehension of words.**

Root Criteria: Primary Progressive Aphasia

Exclusions:

1. Symptomology is not better attributed to another **medical** or **neurological condition.**
2. Symptomology is not better attributed to a **psychiatric disorder.**
3. Primary and most prominent symptom is/was **NOT episodic memory** (AD) nor **visual/visuospatial symptoms** (PCA or DLB).
4. Primary and most prominent symptom is/was **NOT behavioral** disturbance (bvFTD, bvAD).

* Primary and most prominent sx was **NOT a Parkinsonian s/s** nor a **motor symptom** (PSP, MSA, CBS, ALS).

Root Criteria: Primary Progressive Aphasia

Inclusion: Criteria 1–3 Must Be Answered Positively

1 Most prominent clinical feature is difficulty with language

2 These deficits are the principal cause of impaired daily living activities

3 Aphasia should be the most prominent deficit at symptom onset and for the initial phase of the disease

Exclusion: Criteria 1–4 Must Be Answered Negatively for a Primary Progressive Aphasia Diagnosis

1 Pattern of deficits is better accounted for by other nondegenerative nervous system or medical disorders

2 Cognitive disturbance is better accounted for by a psychiatric diagnosis

3 Prominent initial episodic memory, visual memory, and visuoperceptual impairments

4 Prominent, initial behavioral disturbance

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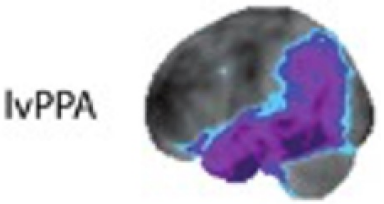
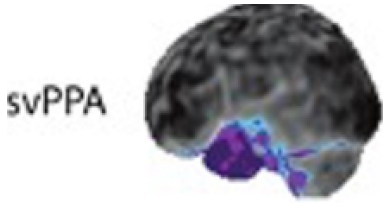
Criteria for Variants of PPAs



1. **lvPPA – AD etiology** (pathology – Amyloid plaques and tau tangles)
   - Impaired **word finding** **AND** impaired **sentence repetition** ***(can't hold a sentence online).***
   - May have **phonemic paraphasia** (*smoile* vs *smile*) and (*may have **parietal signs**).

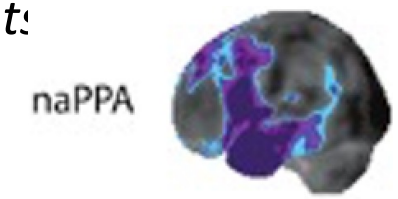
2. **svPPA – FTD etiology** (pathology- TDP 43)
   - Impaired **confrontational naming** **AND** impaired **single word comprehension** ***(pt has lost dictionary)***
   - May have **impaired object knowledge, surface dyslexia** (*difficulty w/ irregular words*), **dysgraphia**, **semantic paraphasia** (eg: *"table" for "desk"),* and/or **emotional liability.**



3. **nfPPA – FTD etiology** (pathology- tauopathy –associated w/ CBS and PSP clinically)
   - Pt will be **agrammatic**, ie: speak/write with **abnormal syntax** *(abnormal sentence structure*) and/or speak with **abnormal prosody** *(rhythm, stress, intonation of speech).*

   OR

   - Pt will have **apraxia of speech** *(impaired planning & programming of motor movements required for speech).* Look for **slow production/rate** of **speech** and **speech errors.**
   - May have **impaired comprehension** of **syntactically complex sentences.**



Marcel Mesulam aphasia= impaired **usage** or **comprehension of words.**

Criteria for Variants of PPA

NOT agrammatic/ NO apraxia of speech
NOT semantic- not lost word dictionary
Special features to note

	Nonfluent/Agrammatic Variant Primary Progressive Aphasia	Logopenic Variant Primary Progressive Aphasia	Semantic Variant Primary Progressive Aphasia
Core features	At least one of the following: Agrammatism in language production Effortful, halting speech with inconsistent speech sound errors (apraxia of speech)	Both of the following core features must be present: Impaired single-word retrieval in spontaneous speech and naming Impaired repetition of sentences and phrases	Both of the following core features must be present: Impaired confrontation naming Impaired single-word comprehension
Supportive features	At least two of the following: Impaired comprehension of syntactically complex sentences Spared single-word comprehension Spared object knowledge	At least three of the following: Speech (phonologic) errors in spontaneous speech and naming Spared single-word comprehension and object knowledge Spared motor speech Absence of frank agrammatism	At least three of the following: Impaired object knowledge, particularly for low-frequency or low-familiarity items Surface dyslexia or dysgraphia Spared repetition Spared speech production (grammar and motor speech)

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Primary Progressive Apraxia of Speech (PPAOS)

- **Primary Progressive Apraxia of Speech** denotes a **neurodegenerative** disorder where apraxia of speech presents as a **pure clinical syndrome (w/o aphasia).**

- **Realize, apraxia of speech may occur in…**
  - Stroke (and often does).
  - Other types of neurodegenerative diseases, eg: **nfPPA, CBS, and PSP**.

- Thus, patients with PPAOS will present as a ***pure motor*** **apraxia of speech**.
  - **Word naming** is **normal**. Although, word may not sound correct.
  - **Word comprehension** is **normal**. Pt understands the meaning of words.
  - All other aspects of **neurological exam** would be **normal**.

Primary Progressive Apraxia of Speech

CONFUSION & CONTROVERSARY

nfPPA requires only **ONE** of two **core criteria**:

1. **Agrammatism - abnormal syntax** *(abnormal structure of spoken or written word*) and/or **abnormal prosody** *(rhythm, stress, intonation of speech).*
2. **Apraxia of Speech -** impaired **planning/programming** of **motor movements** required for **speech.**

- Therefore, **some pts** will have **only #1**, others **only #2**, and others **both #1 and #2.**

Confusion:

- If pt has apraxia of speech, and **assessment for aphasia is not done well**, he/she could have a pure PPAOS, but easily be **misdiagnosed** as having **nfPPA**.
- RECALL in **nfPPA** must have aphasia to meet root criteria. We can evaluate for aphasia by assessing for ability or **inability to comprehend complex sentences** *(supporting feature).*

Controversary:

- Should **PPAOS** be viewed as a **separate condition** altogether or a **subtype** of **nfPPA**?

Association of Learning Disability with PPAs

Table 2. Percentage of Individual and Family History of a Learning Disability

History of Learning Disability	Group, No. (%)			
	Control Subjects (n=353)	Typical Amnestic AD (n=154)	Behavioral Variant of FTD (n=84)	PPA (n=108)
Individual	5 (1.4)	7 (4.5)	6 (7.1)	16 (14.8)[a]
Family	24 (6.8)	16 (10.4)	12 (14.3)	32 (29.6)[a]

Abbreviations: AD, Alzheimer disease; FTD, frontotemporal dementia; PPA, primary progressive aphasia.

[a]The individual and family history of learning disability is significantly elevated in the PPA group compared with the other groups, $P < .001$.

REF: Rogalski E., Johnson S., Weintraub S., Mesulam, M. Increased Frequency of Learning Disability in Patients with Primary Progressive Aphasia and Their First –Degree Relatives. *Arch Neurol.* 2008;65(2):244-248. doi:10.1001/archneurol.2007.34.

Zoom Poll 1: Recognizing criteria for PPA variants

Which of the following test results would lend most weight to a diagnosis of lvPPA?

(You may choose one or more than one response)

a) Surface dyslexia *(inability to pronounce irregularly spelled words)*

b) Impaired sentence repetition *(impaired phonological loop)*

c) Speech with abnormal syntax *(abnormal sentence structure, eg: the absence of articles, prepositions, or word-endings)*

d) Very slow, laborious production of speech

Optimize Bedside Testing

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Speech vs Language?

SPEECH

Planning and programming of motor movements to articulate words.

LANGUAGE

Usage or comprehension of words.

Speech Eval- CONVERSATION

Does patient have agrammatism or apraxia of speech?

1. Agrammatism:

- **Abnormal syntax** *(abnormal structure of spoken or written word*) and/or **abnormal prosody** *(rhythm, stress, intonation of speech).*
- *Think!* Is **sentence structure simplified**, eg: absence of articles (“a”, “the”, “her”), plural endings (-s), prepositions (“to”, “because”), and/ or past tense (-ed).

2. Apraxia of Speech:

- **Impaired planning** and **programming** of **motor movements** required for **speech.**
- *Think!* Is the pt having trouble **moving mouth/tongue** to **articulate words**?
- Oftentimes pt will be aware they are not articulating well, and will try to **self-correct**.
- **Rate** will be **slow**, speech may be **effortful, halting,** or **groping**?

Speech Eval – REPETITION

Test for SPEECH APRAXIA:

- **AMRs** (Alternating Motion Rates): "*Pah, pah, pah… Tah, tah, tah…* Kah, kah, kah…"
- **SMRs** (Sequential Motion Rates): "*Pah, tah, kah…..*", "*Tah, kah, pah…*"
- **Repetition of difficult words:** "*caterpillar*", "*artillery*", "catastrophe" (*repeat rapidly*)
- **Repetition of difficult Sentences**:
  - *"The wicked rhinoceros ran down the hippopotamus."*
  - *"Ingenious iguanas improvised an intricate impromptu."*

* May want to add **oro—buccal apraxia** here: "*Pretend you are blowing out a candle*" (often present w/ speech apraxia)

Speech Eval for nfPPA and PPAOS

68 y/o F with nfPPA (Non-Fluent/Agrammatic Primary Progressive Aphasia)

- Speech is agrammatic (**abnormal syntax** *(sentence structure*) and **abnormal prosody** *(rhythm, stress, intonation of speech).*

https://journals.lww.com/continuum/pages/videogallery.aspx?autoPlay=false&videoId=156

70 y/o F with Apraxia of Speech

- She is challenged with **AMRs, SMRs** and repetition of **difficult words.**

https://journals.lww.com/continuum/pages/videogallery.aspx?autoPlay=false&videoId=157

Say we noticed this patient had apraxia of speech at this point in time.

Zoom Poll 2: Differentiating between PPAOS and nfPPA

Which bedside test would be most helpful in differentiating between PPAOS and nfPPA when apraxia of speech is present?

(Choose only ONE response)

a) Test for surface dyslexia *(ie: the inability to read irregularly spelled words)*

b) Challenge with AMRs, SMRs and repetition of difficult words, eg: *artillery, caterpillar*.

c) Check for comprehension of single words with a naming test.

d) Check for comprehension of complex sentences, eg: *Point to your ear, close your eyes, and say "ah".*

Language Eval – COMPREHENSION

RECALL nfPPA, supporting feature:

- **Impaired comprehension** of **syntactically complex sentences.**

Bedside testing:

- *Point to the ceiling after you point to the floor.*
- *Point to your ear, close your eyes, and say "ah".*
- *It was the boy that the girl chased. Who did the chasing?*

Say during conversation, we have deduced that patient has NO agrammatism nor speech apraxia, what next?

Language Eval - CONVERSATION

LISTEN for….

- **Word-searching (word-finding):** prolonged pauses in speech as the patient searches for a word.
- **Circumlocutions:** the use of more words than necessary to describe an idea; often a result of word-finding difficulty.
- **Semantic paraphasias** – semantically related errors (ie: similar in meaning to the target word; eg: "*fork*" for "*spoon*", "table" for "desk".
- **Phonologic paraphasias** – errors that sound similar to the target word. The resulting error can be a word or a non-word "*smoile*" for "*smile*", "*kesk*" *for "desk".*

Now, we notice word-searching and circumlocutions? What are we thinking?

Zoom Poll 3: Differentiating between PPA variants

Prominent word-searching and circumlocutions are commonly seen in ___.

(Choose only ONE response; the BEST response)

a) lvPPA (logopenic variant PPA)

b) svPPA (semantic variant PPA) C

c) nfPPA (non-fluent, agrammatic PPA) B

Zoom Poll 4: Confirming lvPPA at the bedside

You suspect lvPPA due to prominent word-searching and circumlocutions. Which of the following bedside tests would help to confirm your suspicion?

(You may choose one or more than one response)

a) Ask the patient to read irregularly spelled words *(check for surface dyslexia)*

C

b) Ask the patient to repeat a sentence *(check for in-tact phonological loop)*

B

c) Ask the patient to name several objects in the room.

Language Eval – SENTENCE REPETITION

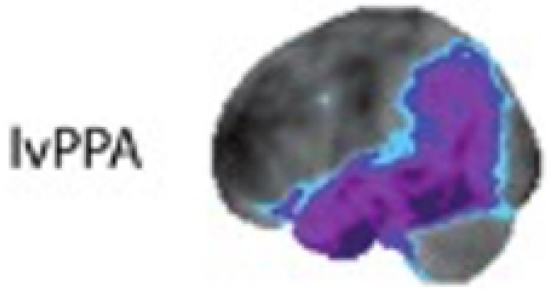
lvPPA – AD etiology (pathology – Amyloid plaques and tau tangles)

- **Core criteria:** Impaired **word finding** **AND** impaired **sentence repetition** *(can't hold a sentence online).*
- Note: **circumlocutions** are often a manifestation of word-searching.
- **Supporting features:** pt may have **phonemic errors** "*smoile*" for "*smile*".
- *We may also with to evaluate for presence of **dominant parietal** signs.

A hallmark** of lvPPA is ***can't hold a sentence online (impaired **phonological loop)**.

Please repeat after me….

- *"John Brown 42 Market Street Chicago."*



Language Eval for lvPPA

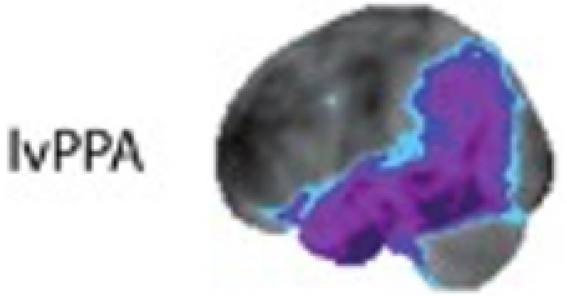
A ?59 y/o M with lvPPA

- *Can't hold a sentence online.*
- Can you identify any **phonemic errors** or **semantic errors**? (supporting features)

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3201824/bin/NIHMS257740-supplement.mpg

Say we established pt has trouble holding a sentence online. What next?

Parietal Signs



We could consider testing for dominant parietal signs:

- **Limb apraxia:**
  1. **Ideomotor apraxia, *eg:*** *With your LEFT hand, show me how would you comb your hair? With your Right hand show me how you would sign your name."*
  2. **Transitive apraxia** (tool use), eg: *With your RIGHT hand, show me how you would use this."* [present a "tool" screwdriver, hammer, tooth brush..etc] Repeat with LEFT hand.
  3. **Intransitive apraxia**, (no-tool), *eg: With your LEFT hand, show me how you would wave good-bye. With your RIGHT hand, show me how you would salute.*

- **Baliant Syndrome (b=bilateral parietal):** optic ataxia, oculomotor apraxia,and simultanagnosia.
- **Gertsmann syndrome (dominant parietal):** acalculia, agraphia, finger agnosia, R-L disorientation.

What testing would you have considered to rule out semantic variant PPA?

Zoom Poll 5: Bedside testing to rule out svPPA

Which of the following results in bedside testing would be particularly helpful to confirm svPPA?

(You may choose one or more than one response)

a) Impaired ability to read irregularly spelled words *(+ Surface Dyslexia)*

C

b) Difficulty with AMRs, SMRs and repetition of difficult words

B

c) Impaired Picture Naming

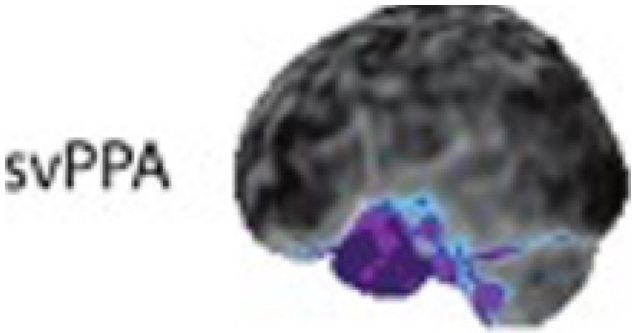
SURFACE DYSLEXIA - Irregular Words (Word Knowledge)

Has the patient lost his/her dictionary?

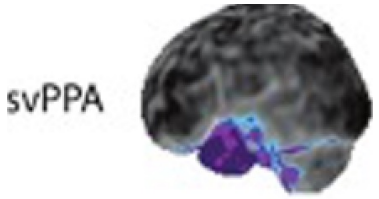
Irregular Words

- **P**int = pint *(short "i" sound pin)*
- **A**che = ah CH ee
- **Y**acht = Yah CHt or YAH - kid

- **B**argain = Bar gah in
- **I**sle = Is LEE
- **G**uide = guh īd



NAMING (Word Knowledge)



Has the patient lost his/her dictionary?

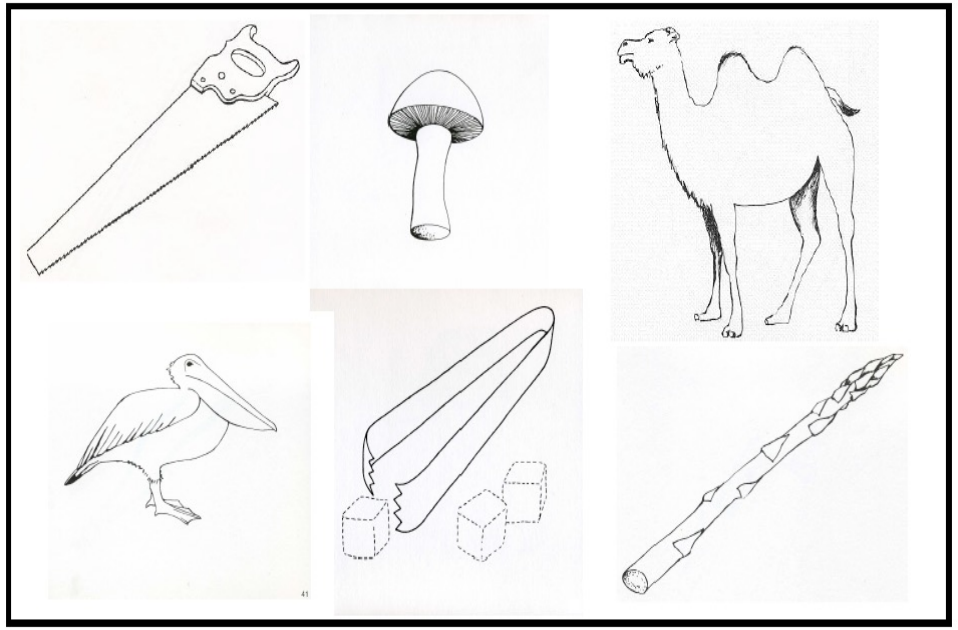
Object Naming:

- Show the patient a pair of **scissors**.
  - *Please name this object*.
  - *Can you tell me what these are use for?*

- Show the patient a **reflex hammer**:
  - *Please name this object*.
  - *Can you tell me what these are use for?*

Visual Confrontational Naming:

- **Show pictures** to the pt (one by one).



PBAC

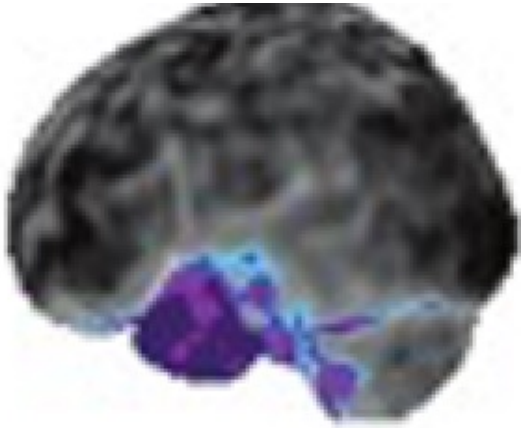
NAMING (Word Knowledge)

Has the patient lost his/her dictionary?

Naming to Description (Verbal Naming)

- *What is a green prickly plant that grows in the desert?*
- *What is an eight-legged creature that spins a web?*
- *What is a black and white striped animal found in Africa?*

svPPA



PBAC

Language- Word Knowledge - svPPA

68 y/o M with svPPA ****he has lost his dictionary.*

- Impaired **object knowledge.**
- Has **surface dyslexia-** tested with **irregular words** (supporting feature)

https://journals.lww.com/continuum/pages/videogallery.aspx?autoPlay=false&videoId=155

Additional Language Testing

ANIMALS (CATEGORY / SEMANTIC FLUENCY)

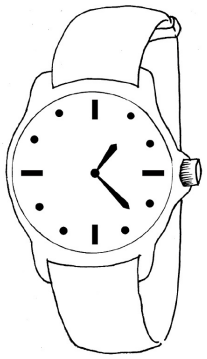
Pt must name as many animals as possible in one min.

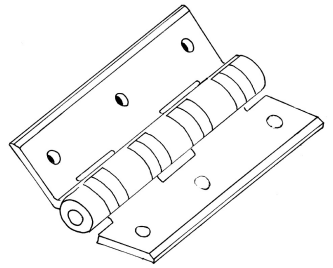
F-WORDS/L-WORDS (LEXICAL / PHONEMIC FLUENCY)

Pt must name as many F-words as possible in one minute.

MULTILINGUAL NAMING TEST (MINT) 31 images
BOSTON NAMING TEST (BNT) 30-60 images

Black and white line drawings ordered according to their ability to be named (correlating with frequency).





Clinical Scenarios

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Clinical Scenario 1- Conversational Interview

HPI: 64 y/o M, retired cardiologist with PMH of AF, hypothyroidism, and depression who presents with word-finding and memory difficulties worsening over about 4 yrs.

Per wife,

- Pt has “trouble getting words out and ideas across”.
- Searches for words, often substitutes, “*the thing-a-mah-jig”* or “*what-u-ma-call-it*”.
- He continues to read the newspaper daily.
- She thinks he is comprehending as well as always.
- Seems a little more forgetful, but not much more than she, herself. ?Normal aging.
- He is still driving an managing finances autonomously and relatively well.
- He is not having prob performing his household tasks.

Your interview assessment:

- No frank agrammatism nor apraxia of speech.
- Prominent **circumlocutions**, **hesitations**, and **word-searching** are noted.
- Pt substituted “***Jackson***” for “***Jefferson***” (hospital) and ”***mooching***” for “***munching***”.

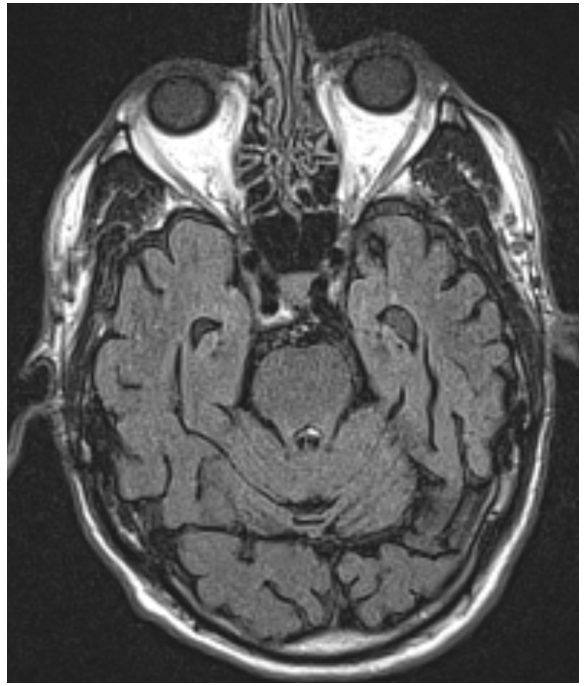
Clinical Scenario 1 - Bedside Testing

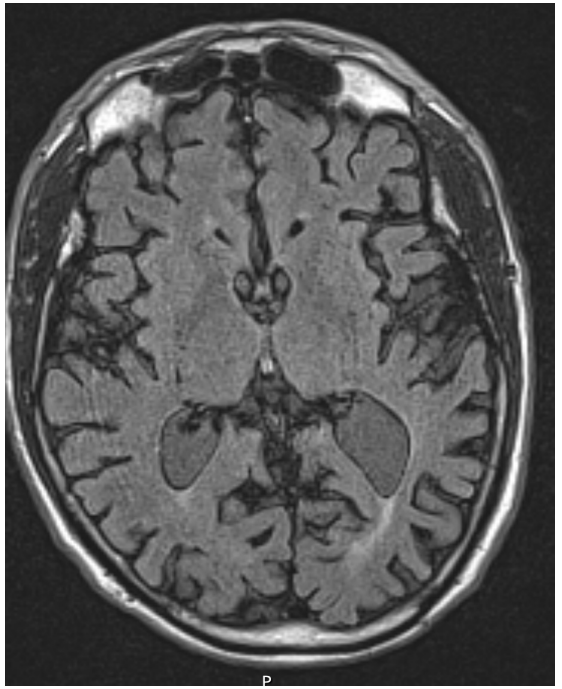
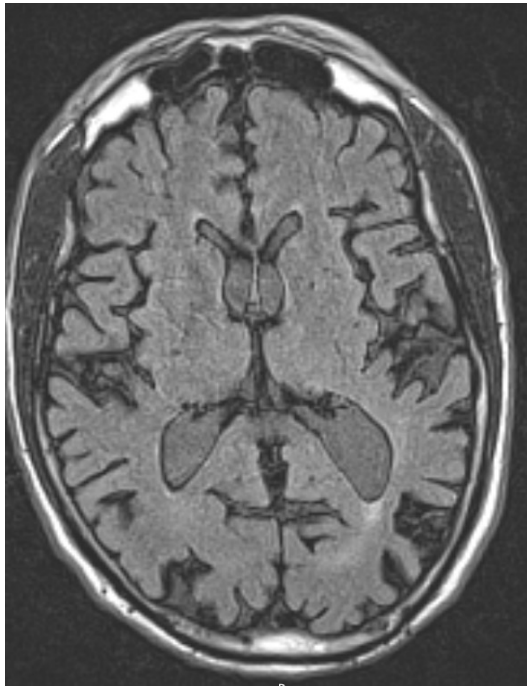
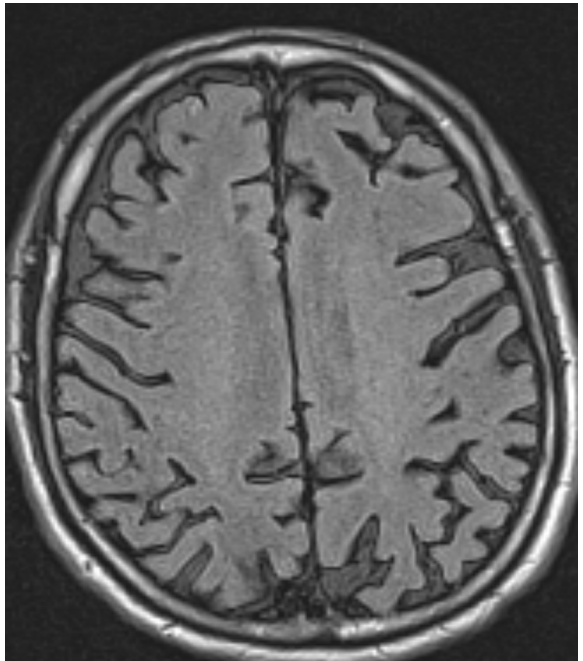
Your thoughts:

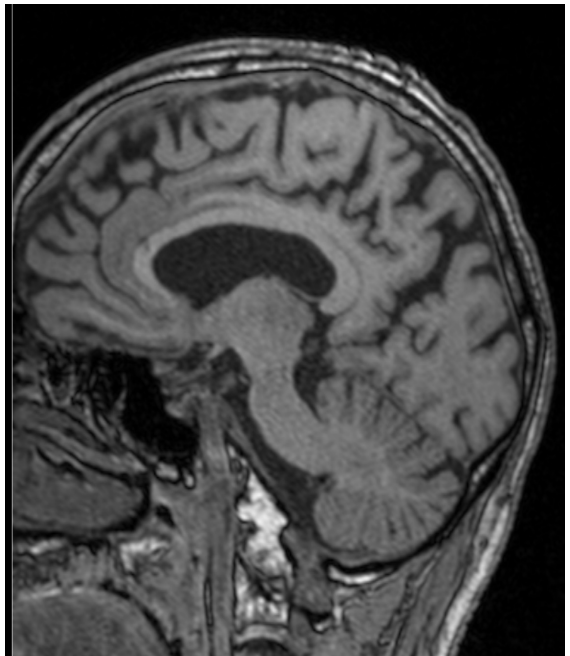
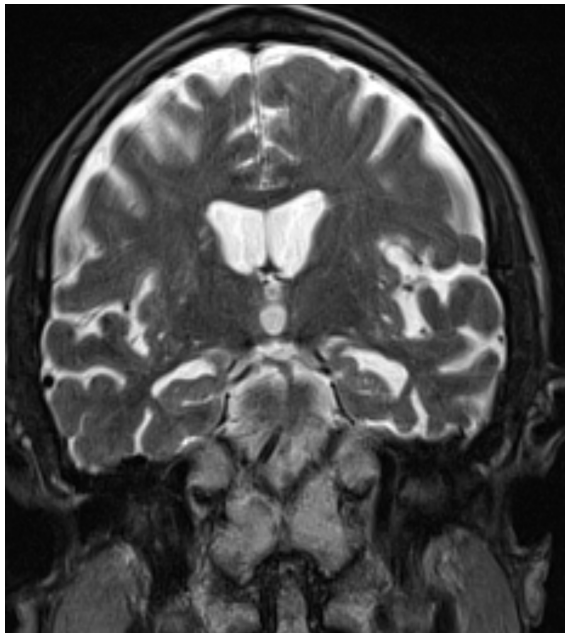
- **Bedside exam would focus on differentiating between logopenic and semantic PPA.**
- ***Can pt hold a sentence online?***
- ***Has he lost his dictionary?***
- ***Presence of dominant parietal signs?***

Bedside Testing:

- Encoded (2,4,5) of a 5-element address.
- Five min later, he recalled 2/5, and then 4/5 with cueing.
- Able to calculate nickels in $1, and quarters in $6.75.
- Named *knuckles* and *stapler*. Could not name *reflex hammer*, but stated it was used to "*hit knees*".
- Correctly pronounced: *pint*, *ache*, *yacht*, *bargain*, *isle*, and *guide*.
- + R limb ideomotor apraxia.
- + R/L disorientation was noted on testing.
- + finger agnosia.



Zoom Poll 6: Clinical Scenario 1- Diagnosis

1. Which of the following is the most likely diagnosis?

(Choose ONE response)

a) Logopenic variant PPA

b) Semantic variant PPA C

c) Non-Fluent/Aggrammatic PPA B

d) We would require more testing to make this diagnosis

DIAGNOSIS: Logopenic PPA

- Etiology: AD
- Pathology: amyloid plaques and tau tangles.
- MRI: atrophy in temporo-parietal junction L>R and posterior parietal cortical atrophy (posterior cingulate gyrus involved).

Clinical Scenario 2 – Conversational Interview

68 y/o M with a PMH of vertigo presents with progressive language problems for 5 yrs.

Per wife,

- Pt started out "occasionally messing up words".
- Progressed to where he would "use unrelated words and/or wrong words".
- For eg, he described his doctor's visit today as a "seminar".
- Recently, he has had more difficulty understanding her when she talks.
- She must speak slow and use very simple words.
- Memory does not seem to be a problem.
- No navigational confusion when driving.
- Manages finances well.
- Continues to do household repairs.
- Runs daily, and works out at the gym for 2-3 hrs/day ~ 5-6 days/week.
- Pt is more easily agitated. Used to be very easy-going.
- No overt anxiety or depression.

Your interview assessment:

- No frank agrammatism nor apraxia of speech.
- Prominent **circumlocutions**, **hesitations**, and **word-searching noted.**
- Referred to his "**dog**" as his "**animal**".

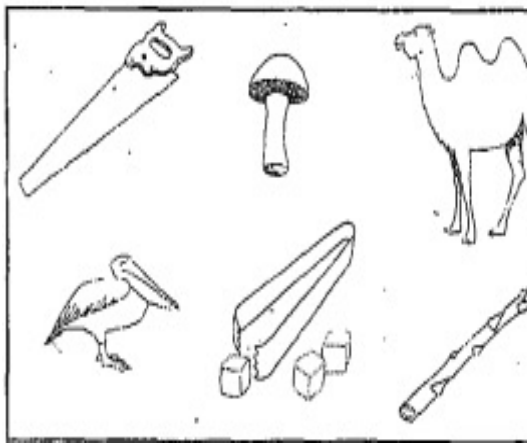
Clinical Scenario 2 – Bedside Testing

Your thoughts:

- **Bedside exam would focus on differentiating between logopenic and semantic PPA.**
- ***Can pt hold a sentence online?***
- ***Has he lost his dictionary?***
- ***Presence of dominant parietal signs?***

Bedside Testing:

- *John Brown 42 Market Street, Chicago.* 4/5 correct (*"**Avenue**" for "**Street**"*)
- Able **name only 2/6 pictures** presented from PBAC.
- Named *knuckles* and *window blinds*. **Unable** to name ***stethoscope*.**
- **Unable** to articulate **what a stethoscope was used for**.
- **Only 1/3 correct on verbal naming PBAC images.**
- **+ Surface dyslexia**, *ache = a-CHee*; *yacht* = Y*a-KET*; *Isle = IS-lee*.



PBAC

Zoom Poll 7: MRI Interpretation of PPA

1. What would you expect to see on this patient's MRI?

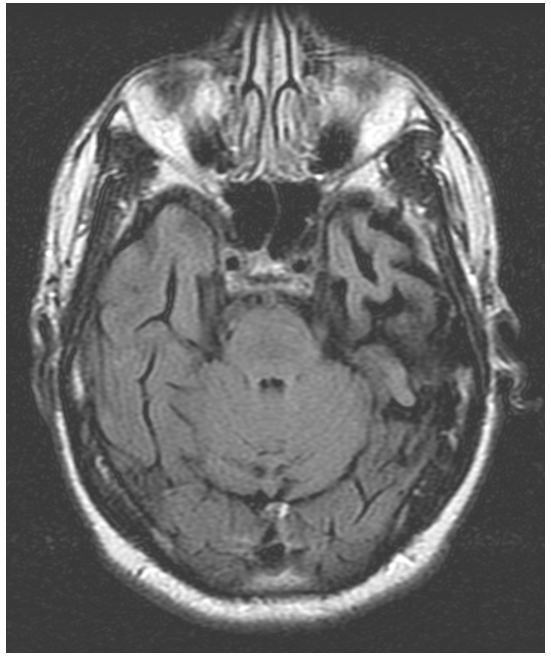
(You may choose one or more than one response)

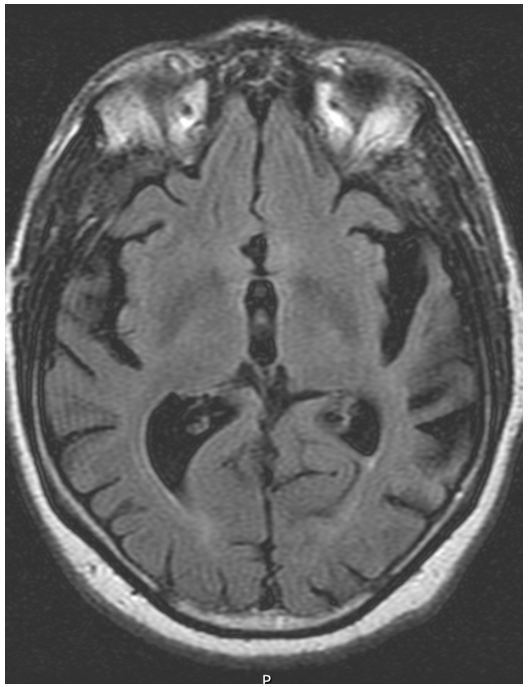
a) Temporoparietal atrophy L>R

b) Frontotemporal atrophy

c) Anterior temporal polar atrophy L>R

d) None of the above would be a significant finding

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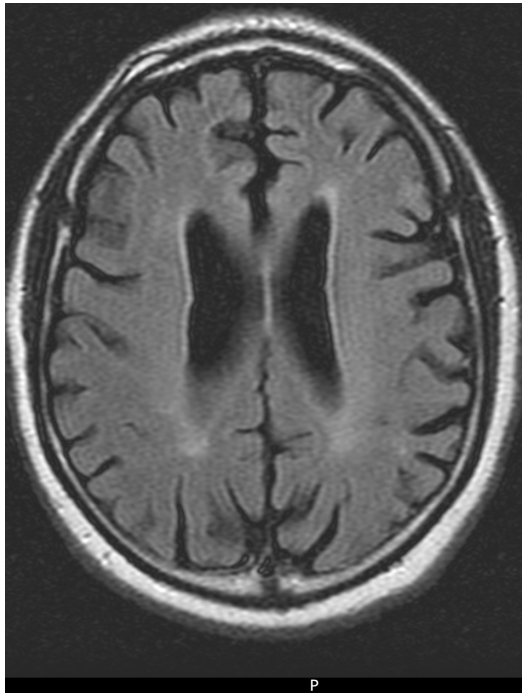
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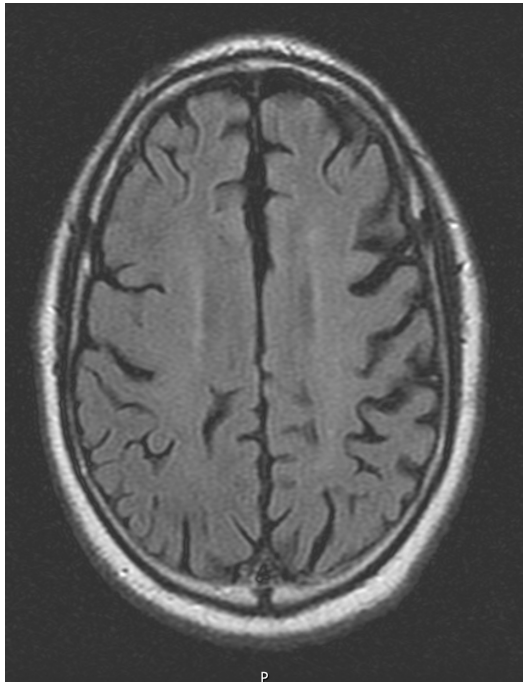
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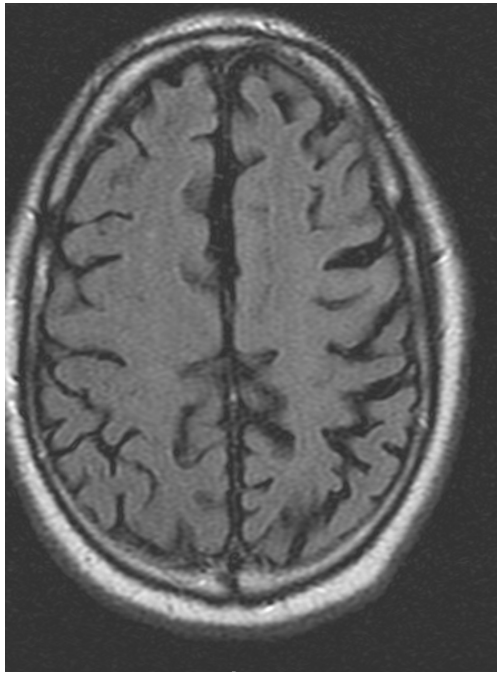


Zoom Poll 8: Clinical Scenario 2- Diagnosis

1. Which of the following is the most likely diagnosis?

(Choose ONE response)

a) Logopenic variant PPA

b) Semantic variant PPA

c) Non- Fluent/Aggrammatic variant PPA

d) I would require more testing to make this diagnosis

DIAGNOSIS: Semantic PPA

- Etiology: FTD
- Pathology: TDP 43 (most often)
- MRI: atrophy in the anterior temporal pole, L>R, often with fronto-temporal involvement.

Neuropathological Features of PPA Variants

APP2APP Virtual Lectures, Inc

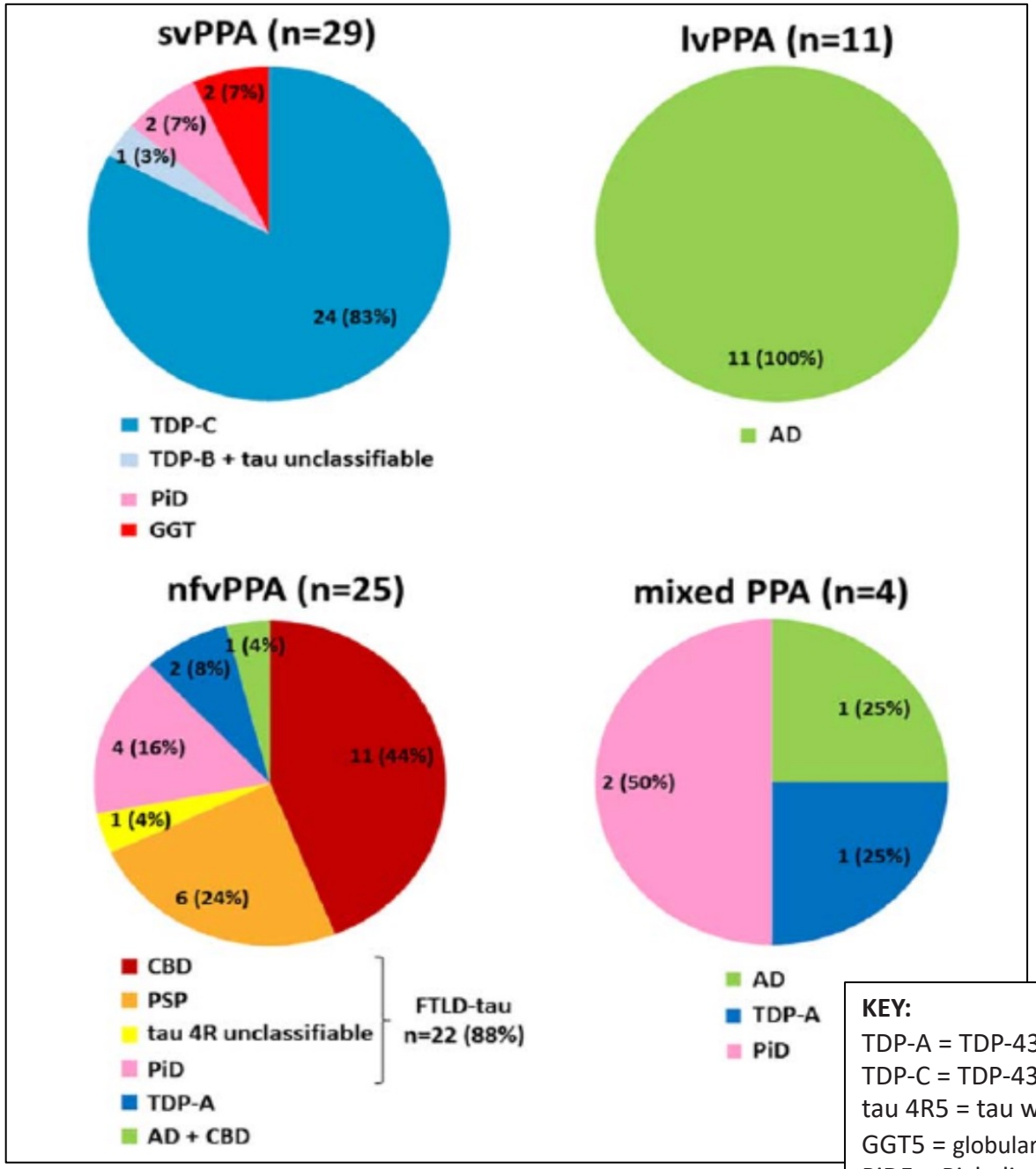
Pathology of PPAs

Neuropathological data were collected from **69 patients with sporadic PPA.**

- 29 semantic (svPPA)
- 25 nonfluent (nfvPPA)
- 11 logopenic (lvPPA)
- 4 mixed PPA

RESULTS:

- 24 of 29 **(83%) svPPA had TDP-43 type C**
- 22 of 25 (**88%) nfvPPA had FTLD type tauopathy**
- 11 of 11 **(100%) lvPPA had AD**
- **4R-tau** was commonly associated with **nfvPPA**
- **Pick disease** was observed in a minority of subjects across all variants except for lvPPA.



KEY:
TDP-A = TDP-43 type A
TDP-C = TDP-43 type C
tau 4R5 = tau with 4 repeats
GGT5 = globular glial tauopathy
PiD5 = Pick disease

REF: Gorno-Tempini, et al. Typical and Atypical Pathology in Primary Progressive Aphasia Variants. Ann Neurol. 2017 Mar; 81(3) 430-443.

PPA clinicopathological cohorts	SvPPA (SD/PPA-S)		NfvPPA (PNFA/PPA-G/PPAOS)		LvPPA (LPA/PPA-L)	
San Francisco, CA, USA -- Gorno- Tempini, et al. 2017 **N= 69**	**N= 29** 24 TDP-C (83%) 2 PiD (7%) 2 GGT (7%) 1 TDP-B+tau (3%)	***TDP= 86%*** ***tau= 14%***	**N= 25** 11 CBD (44%) 6 PSP (23%) 4 PiD (16%) 2 TDP-A (8%) 1 AD-CBD (4%) 1 tau 4R nos (4%)	***tau= 88%*** ***TDP= 8%*** ***AD= 4%***	**N = 11** 11 AD (100%)	***AD= 100%***
Sydney, Australia & Cambridge, UK – Chare et al. 2014 **N= 69**	**N = 31** 21 FTLD-TDP (68%) 5 FTLD-tau (16%) 5 AD (16%)	***TDP= 68%*** ***tau= 16%*** ***AD=16%***	**N = 16** 8 FTLD-tau (50%) 5 FTLD-TDP (31%) 3 AD (19%)	***tau= 50%*** ***TDP= 31%*** ***AD= 19%***	**N = 22** 17 AD (77%) 3 FTLD-TDP (14%) 2 FTLD-tau (9%)	***AD= 77%*** ***TDP= 14%*** ***tau= 9%***
Chicago, IL, USA – Mesulam et al. 2008, Mesulam et al. 2014[a] **N=58**	**N = 3** 2 FTLD-TDP-C (67%) 1 AD (33%)	***TDP= 67%*** ***AD= 33%***	**N = 17** 4 CBD (24%) 3 FTLD-TDP-A (18%) 3 PiD (18%) 3 PSP (18%) 2 AD (12%) 1 LBD + AD (6%) 1 tau nos (6%)	***tau= 65%*** ***TDP= 33%*** ***AD= 12%*** ***mixed=6%***	**N = 32** 18 AD (56%) 7 TDP-A (22%) 3 CBD (9%) 1 TDP-B (3%) 1 TDP-C (3%) 1 PiD (3%) 1 tau nos (3%)	***AD= 56%*** ***TDP= 28%*** ***tau= 16%***
Manchester, UK – Harris et al. 2013 **N= 30**	**N = 4** 4 TDP-C (100%)	***TDP= 100%***	**N = 8** 3 CBD (38%) 2 TDP-A (25%) 1 PiD (13%) 1 CJD (13%) 1 AD + LBD + vasculitis (13%)	***tau= 50%*** ***TDP=25%*** ***mixed=25%***	**N = 13** 7 AD (54%) 3 TDP-A (23%) 1 LBD (8%) 1 CJD (8%) 1 CVD (8%)	***AD= 54%*** ***TDP=23%*** ***other=23%***
London, UK – Rohrer et al. 2011, Rohrer at al. 2012[b] **N= 47**	**N = 23** 19 TDP-C (83%) 4 PiD (17%)	***TDP= 83%*** ***tau= 17%***	**N = 10** 4 CBD (40%) 3 PiD (30%) 3 TDP-A (30%)	***tau= 70%*** ***TDP= 30%***	**N= 14** 14 AD (100%)	***AD= 100%***

Summary

✓ **Logopenic (lvPPA) - AD etiology** (pathology – Amyloid plaques and tau tangles)

- **Core criteria:** Impaired **word finding** **AND** impaired **sentence repetition** ***(can't hold a sentence online).***
- Test using **SENTENCE REPETITION,** and we may want to add assessing for **DOMINANT PARIETAL SIGNS**, eg: limb apraxias. ***Gertsmann syndrome** (acalculia, agraphia, finger agnosia, R-L disorientation).
- **MRI:** peak atrophy in temporo-parietal junction L>R and post parietal lobes *(post cing gyrus involved).*

✓ **Semantic (svPPA) – FTD etiology** (pathology- TDP 43) ***(pt has lost dictionary)***

- **Core criteria:** Impaired **confrontational naming** **AND** impaired **single word comprehension**
- Test with **NAMING:** confrontational naming (*pictures*), object naming (*objects in room and describe function*), naming to description, irregular words (***surface dyslexia***), ***dysgraphia***. **Emotional liability**.
- **MRI:** peak atrophy in the anterior temporal pole, L>R. Often with fronto-temporal involvement.

✓ **Agrammatic (nfvPPA) - FTD etiology** (pathology- tauopathy –associated w/ CBS and PSP)

- **Core criteria: agrammatism-** abn syntax (*sentence structure*), abn prosody (*rhythm, stress, intonation),* OR **apraxia of speech** (*imp planning and programming of motor movements to articulate words*).
- Test for **speech apraxia:** challenge with AMRs, SMRs, difficult words and difficult sentences.
- Test for **comprehension of complex sentences.** Be sure pt has a true "**aphasia**".
- **MRI:** peak atrophy in ventro-lateral portion of the inferior frontal gyrus, insula L>R, and frontotemporal.

****All FDG PETs:** hypometabolism corresponding to patterns of regional cortical atrophy in MRIs.

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Questions?

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