

Literature Review: Diagnosing Types of Dementia Using Biomarkers

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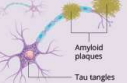



Introduction¹

Diagnosing types of dementia early in the disease process is necessary in creating management strategies such as early planning, determining the cause, beginning treatment as soon as possible, and identifying and treating other associated symptoms.

Understanding Different Types of Dementia

As we age, it's normal to lose some neurons in the brain. People living with dementia, however, experience far greater loss. Many neurons stop working, lose connections with other brain cells, and eventually die. At first, symptoms can be mild, but they get worse over time. Read on to learn more about four different types of dementia.

TYPES OF DEMENTIA

Alzheimer's Disease	Frontotemporal Dementia	Lewy Body Dementia	Vascular Dementia
What Is Happening in the Brain?			
Abnormal deposits of proteins form amyloid plaques and tau tangles throughout the brain. 	Abnormal amounts or forms of tau and TDP-43 proteins accumulate inside neurons in the frontal and temporal lobes. 	Abnormal deposits of the alpha-synuclein protein, called "Lewy bodies," affect the brain's chemical messengers. 	Conditions, such as blood clots, disrupt blood flow in the brain. 

*These changes are just one piece of a complex puzzle that scientists are studying to understand the underlying causes of these forms of dementia and others.

Symptoms

Mild <ul style="list-style-type: none">Wandering and getting lostRepeating questions Moderate <ul style="list-style-type: none">Problems recognizing friends and familyImpulsive behavior Severe <ul style="list-style-type: none">Cannot communicate	Behavioral and Emotional <ul style="list-style-type: none">Difficulty planning and organizingImpulsive behaviorsEmotional flatness or excessive emotions Movement Problems <ul style="list-style-type: none">Shaky handsProblems with balance and walking Language Problems <ul style="list-style-type: none">Difficulty making or understanding speech <p><small>There are several types of frontotemporal disorders, and symptoms can vary by type.</small></p>	Cognitive Decline <ul style="list-style-type: none">Inability to concentrate, pay attention, or stay alertDisorganized or illogical ideas Movement Problems <ul style="list-style-type: none">Muscle rigidityLoss of coordinationReduced facial expression Sleep Disorders <ul style="list-style-type: none">InsomniaExcessive daytime sleepiness Visual Hallucinations	<ul style="list-style-type: none">Forgetting current or past eventsMisplacing itemsTrouble following instructions or learning new informationHallucinations or delusionsPoor judgment
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Typical Age of Diagnosis

Mid 60s and above, with some cases in mid-30s to 60s	Between 45 and 64	50 or older	Over 65
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Diagnosis

Symptoms can be similar among different types of dementia, and some people have more than one form of dementia, which can make an accurate diagnosis difficult. Symptoms can also vary from person to person. Doctors may ask for a medical history, complete a physical exam, and order neurological and laboratory tests to help diagnose dementia.

Treatment

There is currently no cure for these types of dementia, but some treatments are available. Speak with your doctor to find out what might work best for you.

Living with dementia can be challenging, but there are ways to manage it. To learn more about these types of dementia and other conditions that can cause dementia, visit www.nia.nih.gov/health/what-is-dementia.



What is a Biomarker?³

Biomarker: "A measurable and quantifiable biological parameter that serves as an indicator of a particular physiological state. In a medical context, a biomarker is a substance whose detection indicates a particular disease state or a response to a therapeutic intervention."

Research Question

In patients presenting with dementia-like symptoms, what biomarkers are effective to use to diagnose the most common types of dementia?

Biomarkers

Alzheimer's Disease^{4,5,6,7,8}

- ↑ P-tau & t-tau
- ↓ Aβ42
- ↑ GFAP, CHIT1, YKL-40
- ↑ Glutamic acid, hypoxanthine, anthranilic acid

Frontotemporal Dementia^{4,5,7,9,10}

- ↓ P-tau & t-tau
- ↑ Aβ42/40
- ↑ GFAP, CHIT1, YKL-40
- Δ NPTX2 & neurofilament light chain
- MRI anterior vs. posterior index

Vascular Dementia^{11,12}

- Brevican & neurocan peptides: VaD < AD
- ↑ MR-proANP, CT-proET-1

Lewy Body Dementia^{13,6}

- CSF α-synuclein: LBD << AD
- ↑ GFAP

Future Directions¹⁴

REPS1 has been identified as a hub gene in both Alzheimer's disease and vascular dementia. Further research is required to determine if it can be used to distinguish between those types.

Conclusion

Understanding the specific biomarkers for each type of dementia is crucial in establishing an early and definitive diagnosis that can determine the appropriate course of treatment. Each of the biomarkers outlined in this literature review vary in their clinical applicability. Although some of them have already been incorporated into clinical practice alongside manifestations and symptoms characteristic to each type of dementia, others still require further research and studies before they are put to use. Some of these biomarkers are specific in their ability to distinguish between dementia types, while a few others reflect general disease processes seen in more than one type.

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