**The Future of Biomarkers and Personalized Treatments for Alzheimer's disease and other Dementias**

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**Key points**

1. Dementia is not a normal part of aging. Not everyone who grows old will develop dementia.
2. Dementia is caused by diseases of the brain. The most common is Alzheimer's.
3. Dementia is not just about having memory problems. It can affect thinking, communication and doing everyday tasks. Most people with dementia also develop behavioral changes.
4. It is possible to have a good quality of life with dementia.
5. It is possible to prevent up to 40% of dementia.

Dementia is an umbrella term for a collection of symptoms that are caused by disorders affecting the brain and impact on memory, thinking, behavior and emotion. The most common is **Alzheimer's disease**, which affects 50-60% of people with dementia. Other types of dementia include **vascular dementia**, **Lewy body dementia** and **Fronto-temporal dementia**. Dementia damages nerve cells so they are no longer able to communicate effectively and this impacts on how our body functions.

Symptoms may include:

1. loss of memory
2. difficulty in finding the right words or understanding what people are saying.
3. difficulty in performing previously routine tasks.
4. personality and mood changes

Alzheimer's disease (AD) is a complex, heterogeneous, progressive disease and is the most common type of neurodegenerative dementia. The prevalence of AD is expected to increase as the population ages, placing an additional burden on healthcare systems. Before the early 2000s, the only sure way to know whether a person had Alzheimer's disease, or any other form of dementia was through autopsy and brain pathology. But due to advances in research, tests are now available to help us see biomarkers associated with dementia in living people. Biomarkers are measurable indicators of what is happening in the body. These can be found in blood, other body fluids, organs, and tissues. AD is first evident with the appearance of Amyloid beta (Aβ) plaques and Tau (T) tangles while people are asymptomatic.

Following are the types of biomarkers and tests available for AD and other dementias.

**Brain imaging**

Several types of brain scans can help with dementia diagnoses and staging. CT Scan, MRI Amyloid PET scans, Tau PET scans and FDG (Flurodeoxyglucose) PET Scans. Medicare covers FDG PET scans to differentiate between frontotemporal dementia (FTD) and Alzheimer's disease (AD) and considering covering amyloid PET scan during the late October meeting.

**Cerebrospinal fluid biomarkers (CSF)**

The most widely used CSF biomarkers for Alzheimer's disease measure amyloid beta (Aβ), tau, and phospho-tau. Decreased Aβ42 or Aβ 42/40 ratio is a positive biomarker for Alzheimer's pathogenesis. Abnormal (low level) Aβ42 becomes detectable in CSF approximately 20 years before the onset of AD.

**Blood Based Biomarkers (BBBM)**

Blood biomarkers are available through select companies like C2N Diagnostics, Quest Diagnostics, LabCorp currently. Mayo Clinic is validating its blood biomarkers and it is expected to have by 2024. Medicare and other health insurance plans may cover only certain types of biomarkers at this time.

**Limitations of biomarkers:**

1. Biomarkers are less sensitive than neuropathology for detection of mild/early pathology.
2. Validated biomarkers are not available for all relevant neuropathologies therefore it cannot be known with certainty in vivo what neuropathologies in addition to AD are present in any individual, or what the proportional neuropathologic burden is among various pathologies.

The National Institute on Aging and the Alzheimer’s Association (NIA-AA) recommend protections against misdiagnosis:

1. Biomarkers should not be used in isolation but should always be interpreted in a clinical context.
2. Only stringently validated biomarkers (fluid or PET) should be used for clinical diagnostic purposes.
3. Conservative interpretation of values near cut points. This includes employing a determinant zone around any biomarker cut point.

**So, what can we do to save our brains? The good news is that it is never too early – or too late - to do something!**

Most people are diagnosed with dementia when it is moderate or advanced, but pre-dementia or Mild Cognitive Impairment (MCI) is diagnosed 5 years *before* dementia. MCI affects about 15-20% of people, Research shows that up to 40% of patients, or about 1 in 3, can revert to normal by modifying certain medical and lifestyle-associated risk factors.

What is good for the heart is good for the brain. There are twelve risk factors, which include education, hearing loss, traumatic brain injury, hypertension, alcohol, obesity, smoking, depression, social isolation, physical inactivity, air pollution and diabetes.

Managing chronic medical conditions, building cognitive reserve, and removing offending medications can go a long way to preventing dementia. It takes some work, but to **Save Your Brain, it is worth it!**

**Sources:**


Risk factors and risk reduction | Alzheimer's Disease International (ADI) (alzint.org)

How Biomarkers Help Diagnose Dementia | National Institute on Aging (nih.gov)

NIA-AA Revised Clinical Criteria - AAIC 2023 DRAFT (alz.org)



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