An Overview of Alzheimer’s Disease

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Alzheimer’s disease (AD) is the most common type of dementia, accounting for an estimated 60-80 % of dementia cases. AD is an irreversible and progressive brain disease, with the most common symptom beginning with memory and difficulty remembering new information. AD was identified more than 100 years ago by Dr. Alois Alzheimer, who first described changes in the brain tissue of a woman in her early 50’s who showed memory, language, visual-spatial, and orientation problems, as well as, delusional thinking. Upon her death, Dr. Alzheimer examined her brain and found her brain showed atrophy and what we now know are amyloid plaques and neurofibrillary tangles, which are two of the main features of AD. AD was originally thought to be a rare presenile dementia and most cases of senile dementia were attributed to arteriosclerosis until the 1970s.

“An estimated 5.4 million Americans of all ages have Alzheimer’s disease in 2011. This figure includes 5.2 million people aged 65 and older and 200,000 individuals under age 65 who have younger-onset Alzheimer’s.

- One in eight people aged 65 and older (13%) has Alzheimer’s disease.
- Nearly half of people aged 85 and older (43%) have Alzheimer’s disease.”

2011 Facts and Figures, Alzheimer’s Association

Alzheimer’s disease can present itself differently in different people, but warning signs often include:

- Memory loss significant enough to disrupt daily life and activities
- Difficulty planning or solving problems
- Challenges carrying out familiar tasks
- Confusion or disorientation to time or place
- Difficulty understanding visual images and spatial relationships
- New problems with speaking or writing
- Forgetting and misplacing things, while losing the ability to retrace steps
- Decreased or poor judgment
- Withdrawal from activities (social, work, etc.)
- Changes in mood and personality

What is Dementia?

- **Dementia**: Decline in intellectual ability impacting memory plus one or more other cognitive abilities severe enough to interfere with everyday functioning
- **Alzheimer’s Disease**: Most common type of dementia
- **Mild Cognitive Impairment (MCI)**: Borderline between normal aging and dementia

Early Signs and Symptoms

One of the first symptoms reported for AD are memory problems, particularly with newly learned information. Memory difficulties may appear subtle at first, often leading many individuals to question
whether the symptoms may be signs of “getting old”. As AD progresses, a person may ask the same question or say something repeatedly within a short period of time, without remembering the prior conversation. Objects may be misplaced and/or lost, and details about recent events may be forgotten. Early in AD, long-term memory remains relatively intact, but memory loss in those areas will eventually develop as the disease progresses.

**Mild Alzheimer’s Disease (MCI)**

As Alzheimer’s disease progresses, memory loss continues and changes in other cognitive abilities appear. Problems can include getting lost, trouble handling money and paying bills, repeating questions, taking longer to complete normal daily tasks, poor judgment, and mood and personality changes. People often are first diagnosed in this stage.

**Moderate Alzheimer’s Disease**

As the disease progresses, neurofibrillary tangles and amyloid plaque spread throughout the brain, beginning in the neocortex. In the moderate stage, damage occurs in areas of the brain that control language, reasoning, sensory processing, and conscious thought. Memory loss and confusion increase, and people begin to have problems recognizing family and friends. They may be unable to learn new things, carry out tasks that involve multiple steps (such as getting dressed), or cope with new situations. They may have hallucinations, delusions, and paranoia, and may behave impulsively.

There may also be a decline in visuospatial skills, language, abstraction, planning and organization. Visuospatial problems may cause a person to become disoriented or lost in familiar environments. Accidents or becoming lost while driving can occur. Language problems such as word-finding difficulty occurs early but impaired comprehension or decreased speech output may occur in the later stages. Declines in planning and organization often result in missed bill payments and difficulty handling finances.

**Severe Alzheimer’s Disease**

By the final stage, plaques and tangles have spread throughout the brain, and brain tissue has shrunk significantly. People with severe Alzheimer’s cannot communicate and are completely dependent on others for their care. Near the end, the person may be in bed most or all of the time, as the body shuts down.

**Changes in the Brain in Alzheimer’s Disease**

Although identified more than 100 years ago, research into the symptoms, causes, risk factors, and treatment for AD has only developed in the last 30 years. While we do not know what starts the AD process, we do know that it is damaging and progressive, and like other common chronic diseases, probably develops as a result of multiple factors. Much research speculates that many changes in the brain may begin taking place as early as 20 to 30 years before the onset of symptoms or problems are evident. Researchers believe that the accumulation of the protein beta-amyloid plaques and neurofibrillary tangles (aggregates of the protein tau), contribute to the development of AD. As more and more plaques and tangles form in particular areas of the brain, neuron cells begin to lose their ability to function and communicate with one another and die. Neurons are a vital part of the
communication within the brain, allowing information and signals to be detected and transferred. In Alzheimer’s disease, abnormal accumulation of plaques and tangles cause neuron cells to die, leading to dramatic shrinkage and cell loss affecting areas of the brain that are responsible for forming memories, thoughts, sensations, emotions, movements, and skills.

**Mild Cognitive Impairment (MCI)**

An established risk factor for Alzheimer’s disease is Mild Cognitive Impairment (MCI), which is a condition where an individual presents with problems with memory, language, and another essential cognitive ability that are severe enough to be noticeable to others and is detected with cognitive tests, but are not severe enough to interfere with daily life and activities. Some studies indicate that up to 10-20% of older adults aged 65 and older have MCI. An estimated 15% of individuals diagnosed with MCI progress and convert to dementia each year. While it is unclear why some individuals will convert from MCI to dementia while others do not, researchers are looking closely at MCI as a possible transitional state between normal aging and the earliest symptoms of AD. Brain imaging and biomarker studies of MCI individuals, may help researchers to detect early changes in the brain like those seen in AD. This could lead to a better understanding of some of the earliest changes, and early detection and diagnosis.

**How is Alzheimer’s Disease Diagnosed?**

There are several methods and diagnostic tools to help determine fairly accurately whether an individual with memory problems has “possible Alzheimer’s disease,” “probable Alzheimer’s disease,” or some other memory or neurological problem. “Possible Alzheimer’s disease” is defined as a dementia that could be due to another condition. “Probable Alzheimer’s disease” means there are no other causes for the symptoms that can be found. Some individuals with memory problems have a condition called amnestic mild cognitive impairment (MCI) that often precedes AD. Individuals with MCI have more memory problems than normal for individuals their age, but their symptoms are not as severe as those seen in AD. Importantly, not all individuals with MCI develop AD. At this time, a definitive diagnosis of Alzheimer’s disease can only be determined by an autopsy of the brain after death. However, at specialized centers, such as the NIA-funded Alzheimer’s Disease Centers, doctors can diagnose AD in a living person correctly up to 90 percent of the time.

A physician will diagnose Alzheimer’s in a living person by:

- Asking questions about an individual’s overall health, past medical history, ability to perform daily activities, and changes in behavior and personality
- Conducting memory tests, problem solving, attention, counting, language skills and other abilities related to brain functioning
- Carrying out medical tests of blood, urine, or spinal fluid
- Collecting information provided by family members or other caregivers about changes in a person’s day-to-day function and behavior which may help in diagnosis
- Performing brain scans, such as magnetic resonance imaging (MRI), positron emission tomography (PET) scan or a computed tomography (CT) scan

These tests are often repeated annually to give doctors an idea about how the individual’s health and memory may be changing over time. Often these tests assist doctors in finding other possible causes of
an individual’s symptoms. For example, depression, brain tumors, thyroid problems, drug reactions, and blood-vessel disease in the brain can cause Alzheimer’s-like symptoms. Some of these other conditions can be treated successfully.

An early and accurate diagnosis is crucial because it tells people whether they have Alzheimer's disease or whether their symptoms are caused by something else. Stroke, tumor, Parkinson’s disease, sleep disturbances, or side effects of medications are all known to affect cognitive function and memory, and some of these conditions are reversible. When AD is diagnosed, knowing early on can help patients and their families plan for the future. It gives families time to discuss care options while the patient can still take part in making decisions. Researchers are developing increasingly accurate diagnostic tests for telltale biomarkers that may one day be used in general medical practice to detect the disease before memory loss or cognitive impairment is evident. Early diagnosis also offers the best chance to treat the symptoms of the disease.

How Alzheimer’s Disease is treated

Alzheimer’s disease is such a complex disease that there is little likelihood of finding one treatment or cure. Scientists are focusing on many aspects of the disease as they seek solutions. The following are areas of focus for current treatments: helping people maintain mental function; managing behavioral symptoms; and slowing, delaying or preventing Alzheimer’s disease.

Helping People with Alzheimer’s Disease Maintain Mental Function

The U.S. Food and Drug Administration (FDA) has approved four medications to treat Alzheimer’s disease. Donepezil (Aricept*), rivastigmine, (Exelon*), and galantamine (Razadyne*) are approved to treat mild to moderate Alzheimer’s. (donepezil can be used for severe cases as well). Memantine (Namenda*) is approved to treat moderate to severe Alzheimer’s disease. They work by regulating the chemicals that transmit messages between neurons, the neurotransmitters. In many cases they work on thinking, memory and speaking skills and may help with certain behavioral problems. The effects do not last, because these drugs do not change the underlying disease process, which continues. Their effectiveness may last for only a few months or a few years.

Managing Behavioral Symptoms

Sleeplessness, agitation, wandering, anxiety, anger and depression are common behavioral symptoms of Alzheimer’s disease. Not every patient experiences them, however. There are many other behaviors that patients may exhibit such as changes in personality or paranoia. Scientists are learning why these behaviors occur, as they research new treatments, both drug and non-drug, to better manage them. This research will allow people with Alzheimer’s disease to live more comfortable lives and their make their care easier for caregivers.

Slowing, Delaying or Preventing Alzheimer’s Disease

Scientists today are looking beyond treating the symptoms of the disease and are focusing on addressing the underlying disease process. They are looking at clinical trials for many possible interventions, such as immunization therapy, cardiovascular treatments, antioxidants, cognitive training and physical activity.