The Neuroscience behind Alzheimer’s Disease

Name:

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**Introduction**

Alzheimer’s disease is a form of dementia, where an individual presents with symptoms of memory loss and difficulties with managing their emotions and understanding their language (Alzheimer's Society, 2021). It is neurodegenerative since some parts of the brain die. More than 60% of older adults in the US have Alzheimer’s disease, and this number continues to rise, presenting a huge burden to caregivers and the healthcare system regarding costs (Brandes, 2020). While studies have yet to find the cure for AD, researchers have gained a better understanding of its neurobiology development and pathology. Following years of research, scientists have been able to discover what happens in the brain when an individual develops AD and the onset of symptoms. This paper reviews the neuroscience behind Alzheimer’s disease and the significance of the brain’s neural structures.

**The neural structures**

The human brain has many billion neurons, which are responsible for sending information to the brain and other parts of the body. When an individual has Alzheimer’s, this disease affects how the neurons communicate in the brain, resulting in memory loss and cell death. In a normal healthy scenario, an individual’s brain shrinks to some extent when they age. However, when an individual has Alzheimer’s disease, their brain loses significant neurons, with some losing connections with other neurons, and eventually dying or stopping to function. The Alzheimer’s disease disorients normal brain processes, including metabolism, repair, and information processing. At first, the disease affects the functioning of the neurons and how they connect to other parts involved in memory, such as hippocampus and entorhinal cortex. The disease also destroys other areas in the brain responsible for language and social behavior. Eventually, a person’s body deteriorates due to inability to live and function independently (Raskin et al., 2015).

The neural structure of the brain is made up of amyloid plaques and Neurofibrillary Tangles, which are the most vital neurological signs of Alzheimer. Tangles are twisted proteins found inside the neurons while plaques are found outside the neurons. Both the plaques and tangles form in the frontal and temporal lobes; which are respectively responsible for thinking and memory. The amyloid plaque is a neural structure that contains small proteins peptides referred to as amyloid beta (Brandes, 2020). These protein betas appear in the form of huge clusters outside the neurons. These protein betas are also resistant enzymes, which aims to destroy unwanted substances in the body, For example, the brain has proteases as enzymes, which are responsible for getting rid of unwanted protein substances. With the resistance of the amyloid betas, it can be difficult for these proteins to destroy them. Hence, as the disease progresses, these proteins build up in the brain (Palmer, 2019).

The main brain structure that is involved with the presence of the Alzheimer’s disease is the frontal lobe. This is the part of the brain responsible for memory as well as other essential functions, such as attention, language, and motivation. The brain has billion neurons that send signals to its other parts for appropriate functioning. The frontal lobe works together with the neurons to regulate how the brain works. For instance, the making of a person’s memory is contingent with the sensory input, which also depends on other parts of the brain. The frontal lobe plays a vital role in decision making and planning, and that is why people who have damaged frontal lobe structures struggle with information processing, memory, and making useful choices (Palmer, 2019). Also, it is through the appropriate functioning of the frontal lobe that a person can coordinate their motor skills, compare objects, react to other people’s feelings, and also develop personality.

When an individual has Alzheimer’s, the disease affects the frontal lobe responsible for working memory. When the disease spreads to the frontal lobe, an individual presents with difficulties in making significant decisions and appropriate plans. Damage to the frontal lobe will, ultimately result in problems with a person’s intelligence, behavior and judgment. People will also experience issues with their personality and behaviors, which are the hallmarks of AD. When a person presents with these symptoms, it can be easier to diagnose them with the Alzheimer’s disease (Palmer, 2019).

The temporal lobe is another brain’s structure affected by the Alzheimer’s disease. The temporal lobe is a part of the brain, that sits on its bottom part and next to the ears, and whose purpose is to ensure a working memory. The temporal lobe is made up of the hippocampus, which regulates an individual’s memory, and it is the first area that is affected by the Alzheimer’s disease (Parra et al., 2013). It has a significant function of ensuring the sound processing and visual for language and object recognition. It is through the function of this lobe that people give meaning to language by understanding and distinguishing language. This lobe also functions as an auditory complex whereby people can interpret information. When an individual has Alzheimer’s disease, they can begin to slowly lose their memory and perceiving language in form of speech and writing (Parra et al., 2013). Alzheimer’s inhibits an individual ability to speak and recognition of familiar objects and sounds.

In summary, Alzheimer’s disease develops when the two proteins; plagues and tangles form in the areas responsible to carry out the brain functions of memory, thinking, and language recognition. These proteins form clusters inside and outside the neurons, which hampers them from sending information to the frontal and temporal lobes.

## References

Alzheimer's Society. (2021). *Dementia symptoms and areas of the brain*. Alzheimer's Society. Retrieved 3 April 2021, from https://www.alzheimers.org.uk/about-dementia/symptoms-and-diagnosis/how-dementia-progresses/symptoms-brain.

Brandes, R. (2020). The current neuroscientific understanding of Alzheimer's Disease. *The Journal Of Undergraduate Research At The University Of Tennessee*, *10*(1). Retrieved 3 April 2021, from https://trace.tennessee.edu/pursuit/vol10/iss1/.

Palmer, S. (2019). The neuroscience of Alzheimer's disease. *British Journal Of Neuroscience Nursing*, *15*(3), 137-139. https://doi.org/10.12968/bjnn.2019.15.3.137

Parra, M., Pattan, V., Wong, D., Beaglehole, A., Lonie, J., & Wan, H. et al. (2013). Medial temporal lobe function during emotional memory in early Alzheimer’s disease, mild cognitive impairment and healthy ageing: an fMRI study. *BMC Psychiatry*, *13*(1). https://doi.org/10.1186/1471-244x-13-76

Raskin, J., Cummings, J., Hardy, J., Schuh, K., & Dean, R. (2015). Neurobiology of Alzheimer’s Disease: Integrated Molecular, Physiological, Anatomical, Biomarker, and Cognitive Dimensions. *Current Alzheimer Research*, *12*(8), 712-722. https://doi.org/10.2174/1567205012666150701103107