Screening Techniques for Alzheimer's Disease

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Alzheimer’s disease is defined as a chronic neurodegenerative disease that affects more than 55 million Americans. By the year 2050 experts project this disease will have increased three fold. Many screening techniques have been investigated to detect this disease early and begin to slow its progression. The purpose of this study was to explore which medical modalities are the most effective for screening of Alzheimer’s disease. This literature review includes three databases, including PubMed, CINHAL, and Cochrance Database of Systematic Reviews. Topics that were researched include: neuroimaging, PET scanning; laboratory diagnostic testing, DNA, and combined studies. All resources were published within the last ten years. Limitations and strengths were considered within each modality. In each category, the following were found to be the most effective in screening for Alzheimer’s disease: cognitive screening tests: MOST and MoCA testing; neuroimaging: PET scanning; laboratory diagnostic testing: biomarkers; DNA: DNA methylation and APOE genotyping; and combined studies: PET scanning. This review demonstrates that there are many screening modalities available to providers. This allows providers to choose their screening technique based on their site’s availability, provider preference, and cost.

Introduction

• Alzheimer’s disease is defined as a chronic neurodegenerative disease that is usually seen primarily in adults who are older than 65
• Currently, there is no cure for Alzheimer’s disease and current treatment options have many side effects. The hope with early detection is to give patients a better quality of life with the potential of slowing the progression of the disease.
• With each research analysis, the research’s strengths, weaknesses, and findings was compiled into meaningful conclusions.
• This research will enable clinicians and medical facilities to be well versed in the various screening techniques available and be able to provide better care to their patients.

Statement of the Problem

A key issue with researching Alzheimer’s disease is its difficulty to diagnose.

• Without fulling understanding the disease, how can practitioners provide effective care and treatment?
• To date, there is no known screening test that has been shown to detect this disease with 100% accuracy.

Research Questions

• What are the effective screening options in the detection of Alzheimer’s disease?
• What limitations exist in these screening techniques?
• What are the benefits in the different screening techniques?

Literature Review

Cognitive Screening Test

• Cl匙nysky and Cl匙nysky (2010) investigated whether integration of 3-word recall, list memory, clock drawing, and time orientation into the Memory Orientation Screening Tests (MOST) would be a more accurate means of screening for Alzheimer’s disease compared to Mini-Cog screening test and the Mini-Mental State Examination (MMSE)
• Freitas, Simoes, Alves, and Santana (2013) conducted a study to determine whether the Montreal Cognitive Assessment (McCA) or the MMSE, was a better screening tool for cognitive decline
• Nakashima et al. (2015) designed a study to find if there is a correlation between regional cerebral blood flow and types of errors on the Clock Drawing Test in Alzheimer’s patients
• Fu et al. (2014) compared the (18) F-FDG PET scanner and the dual biomarker (11) C-PiB PET (11) C-PiB and amyloid PiB (11) C-PiB) for a screening of Alzheimer’s disease, patients with mild cognitive impairment, and patients that were cognitively normal
• Rabinirovich et al. (2011) compared PET scanning with amyloid ligand Pittsburgh compound b (PiB-PET) to florouracilodex glucose (FDG-PET) in discriminating between frontotemporal lobar degeneration and Alzheimer disease
• Smalagic et al. (2015) investigated different studies regarding the disorder that if F-FDG PET scan in identification of patients with mild cognitive impairment who would progress to Alzheimer’s dementia or other types of dementia

Labratory Diagnostic Testing

• Burnham et al. (2016) investigated whether high or low neocortical beta-amyloid proteins (NAB) could predict a patient’s risk of development of Alzheimer’s disease within a 54-month period of time
• Mattsson et al. (2016) designed a study to test whether there is a correlation between plasma tau and Alzheimer’s disease
• O’Bryant et al. (2011) designed a study to investigate the relationship between serum biomarker proteins and Alzheimer’s disease
• Vemuri et al. (2017) identified 430 patients (age greater than 60) that were from the Mayo Clinic Study of Aging. Researchers wanted to investigate whether there is a correlation between patients with comorbidities and neurodegeneration

DNA

• Bollati et al. (2011) found that patients that had higher levels of LINE-1 methylation performed better on the MMSE. Kennedy, Cutter, and Schneider (2014) concluded that patients that were APOE epsilon 4 carriers had more cognitive impairment and faster decline than those that had the APOE epsilon 4 genotype only

Combined Studies

• Bateman et al. (2012) found that the concentrations of the beta-amyloid protein in CSF for patients with AD was found within 25 years before the onset of symptoms. Because the use of beta-amyloid proteins as a screening technique has found to be questionable, as shown in laboratory diagnostic testing conclusions, this conclusion should be researched further
• Palmqvist et al. (2015) found that both CSF biomarkers and amyloid PET scanning could be used in the identification of early Alzheimer’s disease. The research of O’Bryant et al. (2011) investigated the biomarkers in serum, versus the medium of CSF in this research. The use of medium may or may not affect the validity of the biomarkers in detection of Alzheimer’s disease. Further research needs to be considered

Applicability to Clinical Practice

• This research proves that there are different medical modalities that can be used for screening of Alzheimer’s disease both in rural and urban areas.
• Each screening test varies in the time it takes undergo the study, and the time it takes to obtain results
• Clinicians should consider the fastest of the screening techniques discussed
• Clinicians should be well versed in the screening techniques that they have available, and be able to interrupt the results
• With early detection of this disease, implementation of treatments can begin and slow the disease progression

References

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Discussion

Cognitive Screening Test

• MOST and the McCA should be used as cognitive screening tests for Alzheimer’s disease in a clinical setting (Cl匙nysky and Cl匙nysky, 2010 & Freitas, Simoes, Alves, and Santana, 2013). Clock drawing was not deemed an adequate method

Neuromaging

• Dual screening PET scanning has potential as a means of screening in the future for Alzheimer’s disease (Fu et al., 2014 & Rabinirovich et al., 2011). The FDG, however, cannot predict whether a patient will progress to Alzheimer’s disease (Smalagic et al., 2015)

Labratory Diagnostic Testing

• There is a correlation between patients being made regarding beta-amyloid proteins and tau proteins as a means of detection of Alzheimer’s disease.
• In addition, O’Bryant et al. (2011) were able to correlate eleven biomarker proteins to Alzheimer’s disease in the patient’s serum and plasma. Vemuri et al. (2017) concluded that vascular health had a direct and indirect impact on neurodegeneration. This relationship, nevertheless, needs to be investigate further according to the researchers

DNA

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