

Memory
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Lecture - 34
Memory Disorders- Alzheimer's Disease

Hello. I welcome you all in the lecture series of memory. As we discussed in the previous lecture, memory disorders, we discussed about the types of memory disorders, retrograde amnesia, endocrine amnesia, Korsakoff syndrome, psychogenic amnesia, transient global amnesia, etc. In today's lecture, we are going to start having our discussion on Alzheimer's disease. which is a form of dementia, one of many types of dementia.

So, in Alzheimer's disease, we know that as the elders are becoming older, they seem to have a problem of memory loss. This is a very common problem. In modern world, because of the healthy lifestyle, technological support, good medical facility, the average life depth has expanded and the death expectancy is around 75 plus years. As a result of this increase in the age length of an elderly, many forms of memory loss has been observed along with many other disorders.

One major challenge which elderlies are feeling in cognition is memory, where as they are getting old, it becomes very challenging for them to remember the names of their dear ones, to execute the day-to-day activities, to remember the objects, where they have placed, how they have to retrieve it and many more information related to it. There are approximately 5.4 million people with Alzheimer's. As I mentioned, it is one of the dementia type illness where we can see the healthy brain, what it looks like, but as an individual faces with the Alzheimer's disease, his brain starts to deteriorate. And in the case of mild you may still see some connection, projection, networking. But in the case of severe Alzheimer's disease, there is a severe neurological damage.

The brain lesions seem to be getting worse if you compare with the healthy brain. Now, the data set which reflects is from the United States. Many countries, the population of Alzheimer is undocumented and unreported. This underreporting of Alzheimer is an alarming situation. Countries like India and many other developing countries.

First symptom in the Alzheimer is the memory decline. And it has been observed that the patient starts to forget or failure to retrieve the name of their family or dear ones. Memory deficit is a very general cognitive problem in these individuals. Where the

individuals, the elderly just have to retrieve the name, but still they feel But the result, they fail in retrieval of the task.

As the disease progresses, because it's a progressive disease, and neurological damage happens as they age, it seems that it affects the cognition tremendously. As the progression of this disease happens, The decline of cognitive ability seems to be an easy indicator in these individuals. Even performing a simple task becomes very complicated and chaotic for them. Anxiety disease can be divided into early phase, intermediate phase and late phase.

This division can provide an insight to a researcher how to approach the problem at these three different levels. When an individual is diagnosed with Alzheimer's disease and an individual is in early diagnosis, there is still, there is a chance to design a neuro rehabilitation test and batteries to delay or to slow down the progression of the disease. This memory deficit, it is very difficult to distinguish behaviorally from normal age-related memory declines. Some common problem which has been noticed and observed in these individuals during the early phase of Alzheimer's disease, misplacing items.

They misplace the items. They don't remember where they have placed the key, where they have placed their iron, where they have placed their stick, where they have placed their clothes, have they locked the wardrobe, have they turned off the fan while leaving the house. forgetting people's name and require more time to learn new information. Some neurological tests can often distinguish between the two normal age-related memory decline. There are many such tests which indicate the deficiency, the cognitive deficiency in Alzheimer's disease.

Alzheimer patients also showed deficiency in working memory performance related to each matched control. So the individuals with Alzheimer disease seem to have failure in working memory compared to the healthy controls. They do not show the normal recency effect on free recall task. If you all remember We have talked about the primacy and recency effect where the list of items need to be retrieved.

What we have observed is that the elderly suffering from Alzheimer's disease don't show the recency effect. They fail to retrieve the items presented recently. Even by the end of the early phase, when the person enters into the intermediate stage and the last stage, the late stage, they need medical attention. It is important for us to understand that in the early phase, the primary caregiver, the family members, can provide assistance. However, as the person ages, it becomes a little complicated and incurable.

Hence, they require medical attention. Hence, they require medical support. Hence, they require a secondary caregiver. Let us see what is happening in the intermediate phase. In the intermediate phase, the anterograde amnesia grows stronger and stronger.

And in some cases, retrograde amnesia may also occur. Now, why is retrograde amnesia growing stronger? Because we saw earlier about the brain damage. The brain is being damaged. There is a neurological loss.

As a result, the brain structures are dying off. Along with them, the networking is getting destroyed and distorted; hence, the retrieval, the storage, the encoding—everything is being compromised. The patient may begin to experience difficulty in naming familiar people. People do not remember the names of those dear to them. As the disease progresses from early to intermediate stages, we have also observed that problem-solving and decision-making abilities seem to deteriorate.

There is a decline in problem-solving ability and decision-making. Even in language, the vocabulary decreases. Low word frequency is present. Why? The same cause.

There is neurological damage to the brain, and it is progressive in nature. In some Alzheimer's disease patients, the progression is very aggressive in nature. So, from the time of early diagnosis, it starts to spread very quickly. Some people have also observed motor deficiencies. Which we call apraxia.

And what we do, we implement some complex motor patterns, such as dressing, writing, or loading a dishwasher. What it does, this complex task assists an individual to overcome the problem. The person will appear clumsy to the others, but eventually the person will need help with these tasks as the disease progresses. Hence, the neuro-rehabilitation method tries to train the individual in such tasks such as dressing, writing, loading a dishwasher, so that they may be independent. They become independent.

And the dependency on the primary caregivers or secondary caregivers can be controlled. As the disease enters into the later phase, it is very severe in nature. This is more and more retrograde amnesia. Individuals do not remember about their past. Even individuals sometimes fail to recognize themselves or their dear ones.

There is a temporal gradient to the retrograde amnesia. What does this mean? The temporal grade, the time, the more recent information being lost before the older information. What does this mean? If the trauma is here and this is your panel of retrograde amnesia,

Then the recent one, this one, recent information seems to be lost first. Now, then the older information. As the disease progresses, the failure of retrograde amnesia is stretched for the back in time, which means if this retrograde period, we have been talking in months, As the disease progresses, it goes through months to years. And it can go up to decades too.

In the later stage of Alzheimer's disease, the patient may remember little of his or her past. A little amount of information. Now, in this late phase of Alzheimer's disease, the patient is completely dependent on caregivers. Caregivers are must. Because it is very difficult for the elderly to execute the simplest tasks such as dressing, using restroom and etc.

Even the basic motor movement becomes very difficult in these individuals. Muscle mass describes as a person is not doing physical exercises. Memory declines to the point that the patient no longer appears to recognize even close family members. So the severity of the Alzheimer's disease can be understood that these individuals are unable to remember their family members with whom they had spent 20 or 30 years of their life. In many cases, the patient no longer responds to their own name also.

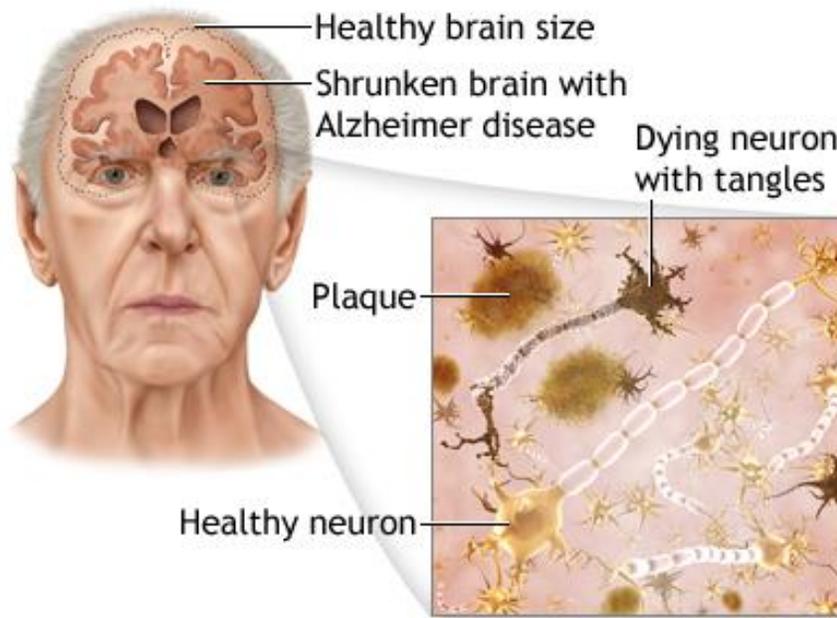
It is very difficult for them to process their name. In lethal stage, it may also lose all access to the language. So it seems that the temporal lobe seems to be very much affected in the Alzheimer disease. The temporal lobe, which is responsible for language area. And here, these individuals are unable to either speak or understand the others.

What is the root cause of Alzheimer's disease? It has been reported that there are number of root causes are there in an elderly. As we saw the healthy brain, but in the case of Alzheimer's, the brain shrinks Neurological damage starts. Clustering of neurons starts to get compromised.

Why is it happening? It is happening because of the plex. It is happening because of the neurofibrillary. The tangles. These amyloid plex are the proteins.

And these proteins inhibits and twist around the neurons. which lead to the neuronal death. More and more neurons start to die, which eventually affects the, and leads towards the memory loss and affects the cognition in an elderly. What we see is that the identical twin, the Alzheimer disease has 50% risk to develop it. Neuronal degeneration begins in the cerebral cortex which includes the temporal lobe, frontal lobe and parietal lobe.

Now we know that the frontal lobe is a central executive system. Temporal lobe, language area, parietal, motor area and this is what exactly we see in these individuals. In later stages, it stretches to subcortical areas. The amyloid plaques from throughout the cortex, it interferes with the normal brain functions. And these amyloid plaques twist around and causing a neurofibrillary tangles, which lead to more neurone deaths.



Source: <https://medlineplus.gov/ency/images/ency/fullsize/23214.jpg>

Now, it is very important for us to understand that we even know that a protein responsible for this is a tau protein. The brain appears to have difficulty in producing a neurotransmitter acetylcholine. So any drug which is going to increase the production of acetylcholine in the bloodstream or in the brain can slow down the Alzheimer disease. So, the deficiency of acetylcholine neurotransmitter can directly be associated with the Alzheimer disease.

Now, how can we prevent Alzheimer's disease? We can prevent Alzheimer's disease by having intellectually challenging activities. Intellectually challenging activities such as stress, problem-solving, decision-making, and an active social life can even lower the risk of developing Alzheimer's disease. If you are hyper-social, if you have a large social network, Alzheimer's disease seems to be delayed. If you are multilingual, Alzheimer's disease may be delayed.

These activities—what do they do? Being multilingual—what does it do to your brain? It spurs the growth of synapses. Being social in nature spurs the growth of synapses. Solving intellectually challenging games or problems.

It increases the growth of synapses, which may act to reduce the development of plaques and delay Alzheimer's disease. Now, what else have we observed? How can we prevent it? Low-cholesterol diets seem to be beneficial. High-cholesterol diets directly impact the brain and increase the rate of the disease.

Many other conditions, such as hypertension, high cholesterol, diabetes, and smoking, have all been correlated with Alzheimer's disease. So having a healthy diet, reading books, playing challenging games, engaging in high-cognitive musical tasks, avoiding smoking, being socially active, and abstaining from alcohol—all these things can help prevent AD. Now, once an individual is suffering from Alzheimer's disease, how should we treat it? Numerous drugs are available in the market. As we discussed earlier, there is a decrease in acetylcholine.

A drug reduces the rate at which acetylcholine breaks down in the brain. Once the breakdown of acetylcholine is stopped, the level of acetylcholine in the brain will be higher. If acetylcholine keeps breaking down, then AD is likely to occur. But the disease can be prevented if one reduces the rate of acetylcholine breakdown.

Lowering the rate of destruction leads to temporary improvement—meaning, if we reduce the breakdown of acetylcholine in the brain, there is temporary improvement in memory and cognitive processes. Current research is focused on finding drugs that will not just reduce the breakdown but inhibit, reverse, or prevent the formation of amyloid plaques, as these plaques block neurons and then spread. They start to spread. Another intervention that seems very effective in treating Alzheimer's disease is TMS.

Transcranial magnetic stimulation seems to cause temporary improvement in cognitive function in Alzheimer's patients. Its focality is very high. It improves neural networking. As a result, improvement in cognitive function is observed. Now, when an individual—and we have been talking about cognitive disorders in the last few lectures—has such a cognitive disorder, how can we overcome it?

So, there is a rehabilitation program for memory. This memory rehabilitation is a domain of clinical psychology and neuropsychology, where the focus is on compensation.

Compensation for what? Compensation for memory loss. How can we compensate for this loss?

Patients with amnesic syndrome are taught to use external memory aids. What are those external memory aids? Alarm clocks. Cell phones, notebooks. This is what we saw in a movie.

Where an individual was having a memory loss problem. In order to remember the information, he was trying to note down the name. In order to remember the information, he was keeping a diary to compensate the memory loss. It can be taught mnemonic strategies which seems to build new neuronal network. So new neuronal network is going to assist an individual to overcome the problem of memory loss or Alzheimer disease.

Intact skills can be used to transfer functions from episodic memory to surviving memory system. Many patients can learn new skills by capitalizing on their intact, implicit memory system. What is more important here for the individual? How they are improving their memory system. Now the last point which is very very crucial here in the memory improvement or rehabilitation is errorless learning.

How can we learn without making an error? Is there a way to learn about the concept or idea without making error? So it's a technique that trains a patient to learn a particular fact or skill while preventing the person from making the errors. And how can we make person from making the error during the training? More and more training is provided to an individual so that the error is reduced.

The same thing we have seen in human factor ergonomics also. Where the employer ensures that his employee should undergo effective training Regress training. Why this effective and regress training is necessary? So that they make less error.

Learners and amazing patients require indirect and procedural memory. It is important for the patient to avoid developing bad habits. If he is guided, such mistakes are avoided, bad habits will not develop. And that is why a training is required in these individuals.

Providing immediate and constant feedback, lot of cues, and lot of repetitions.

How can we make this learning errorless? By providing lot of cues, memory aids. If you provide the aid to the memory memory aid what is memory aid? you provide immediate and constant feedback lot of cues can also act as a memory aid and lot of repetition let me summarize we understood that Alzheimer's disease a form of dementia is a new natural

problem. where individual seems to face the problem of amnesia and it can be classified into three stages.

Early stage, where the AD patient does not require assistance from secondary caregivers. The home environment is enough to delay the disease. More and more social support, coordination, love, and warmth the patient receives from family members. It delays the process. As the individual enters the intermediate stage of Alzheimer's disease, they immediately require nursing staff.

They require assistance. Problem-solving and decision-making are frequently compromised. Language seems to be compromised, and slowly, aggression in Alzheimer's disease is observed, which leads to the late phase where a person cannot execute tasks without caregivers. To understand the root cause of Alzheimer's disease, we examined several aspects. One such aspect is that amyloid plaques are formed.

These amyloid plaques lead to neurofibrillary tangles. Foldings occur, which are a result of the tau protein. The breakdown of acetylcholine in the system is one root cause. So, how can we prevent it? We can prevent it by administering medication.

which can reduce the breakdown of acetylcholine in the system. We can prevent the disease by providing a social support to the individual. We can prevent the disease by providing our care, love, warmth by all the family members, by the family. And towards the treatment, such aspects seem to be considered. A neuro-rehabilitation program is designed

where lot of memory aids, cue, diary, information maintenance is being given to the individual and as the person progresses in the disease from early intermediate to late, they use such tools and techniques to delay the Alzheimer's disease. More importantly, how can we have an RNS learning? We can have RNS learning with training, the structured program where an individual learns from the feedback, the feedback which has been constantly provided to them. As a result, an individual makes less and less error.

With this, we complete week 7 on memory disorder and in next lecture, We are going to learn and going to conclude this lecture series of memory. Thank you.