

Alteration of Memory and Depression in Elderly with Full Overdenture – Pilot Study

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Abstract

Tooth loss can cause cognitive impairment. Good chewing functions are associated with nutritional intake and increased oxygen levels in the prefrontal and hippocampal cortex, which play an important role in learning and memory. The relationship between tooth loss, depression and memory is a complex relationship in which can affect each other.

This pilot study aimed to identify and analyze alteration of memory status and depression level in elderly after using full overdenture.

This was an experimental design using non-randomized clinical pre-test and post-test. Six people with two abutments remaining in the upper jaw and lower jaw became subjects in this study. Examination of memory power using the Mini-Mental State Exam (MMSE) and to check the level of depression used Geriatric Depression Scale (GDS). Measurement of MMSE and GDS were done before treatment and 1 and 3 months after insertion time.

The results showed that there was an increase in the initial mean MMSE score 26 after 1 month increased to 27.33 and 28.17 after 3 months. Results of paired analysis showed that there were significant differences strength of memory in the elderly before using overdenture, after 1 month and 3 months. The GDS value decreased from initial mean score of GDS 3.5 to 2.67 after 1 month and 2.17 after 3 months. Paired t test also showed significant differences levels of depression before using overdenture, after 1 month and 3 months.

There were significant increase in the elderly memory before and after use overdenture. Similarly, there was a significant decrease in the level of depression in the elderly after using overdenture.

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Introduction

Toothloss prevalence increases with age in the elderly, which may lead to impaired physiological and psychological function in the elderly. The elderly's negative attitude toward the maintenance of oral and dental health can be bad for dental and oral health. The alteration of the stomatognathic system may be an important factor that triggers and aggravates neurodegenerative diseases.^{1,2}

Cognitive impairment is one of the

neurological symptoms in the elderly and involves memory loss and abnormal behavior.³ Tooth loss may be considered an early marker of decline and weakness in the elderly. Studies have shown an association between tooth loss and cognitive impairment and dementia onset in the elderly population.⁴ There is a hypothesis that periodontal disease originating from inflammatory molecules, bacteria and bacterial products promotes brain inflammation.⁵ Research conducted on animals attempts to observe the association of the mastication hypofunction with cognitive function showed poor performance in memory and learning tests.⁶ Loss of teeth in large quantity and over long periods of time can cause mental and physical stress. When a person is no longer able to adapt to the stress that occurs, it will cause a state of depression.² Restoration and rehabilitation of tooth loss could

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prevent the decline in brain function by improving the function of mastication.¹

Overdenture treatment retains some of the remaining natural teeth, maintains the alveolar bone around the tooth, and maintains the function of the periodontal tissue sensory mechanism. Overdenture helps to overcome some of the problems caused by conventional full dentures such as progressive bone loss, poor retention stability, periodontal proprioceptor loss, low mastication efficiency, and so on.⁷⁻⁹ The rationale of overdenture is to maintain one part of the main sensory inputs, ie input from periodontal proprioceptive, periodontal receptor input also provides protection against excessive occlusal load, which will guide and monitor gnathodynamic function.^{7,10}

The purpose of this study was to analyze the memory status and depression level of elderly before and after using full overdenture.

Materials and methods

This study is a clinical experimental with non-randomized pre-test and post-test design. The population of the study were patients who came to Oral and Dental Hospital, Hasanuddin University who wanted to make denture. Sampling using purposive sampling method with age criteria 55-64 years with 2 canines root left in upper and lower jaw, not use denture for at least 3 months, not suffering systemic disease, able to communicate well, have score MMSE > 16 and willing to follow the research procedure by signing the informed consent. A total of 6 patients became sample of this study.

Memory status was measured using the Mini-Mental State Exam (MMSE) questionnaire instrument, consisting of 11 questions that measured five areas of cognitive function, orientation, registration, attention and recalculation, recall, and language. MMSE scoring includes 0-16 definite cognitive impairment, 17-23 probable cognitive impairment and 24-30 normal.¹¹ Depression level using Geriatric Depression Scale (GDS) instrument with depression assessment if score ≥ 5 .¹²

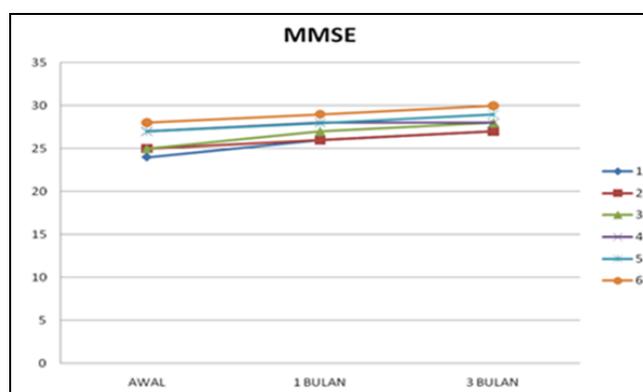
MMSE and GDS data collection is done to all patients prior to clinical treatment, then refer to the conservation department for root canal treatment and composite restoration. Full overdenture made according to standard operating procedures (SOP) at the Department of Prosthodontics Faculty of Dentistry Hasanuddin

University, Makassar. MMSE and GDS status reassessments were performed after one and three months after denture insertion.

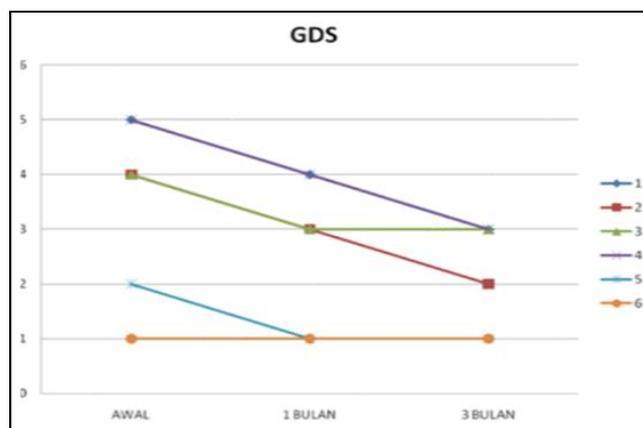
All data were analyzed using paired t-test with 95% confidence level and significance level of $P < 0.05$.

Results

From the result of the study, the mean value of initial MMSE score is 26 while mean score of MMSE 1 month is 27,33 and mean MMSE score 3 month is 28,17. This indicates an increase in MMSE score before and after treatment with complete overdenture (Graph 1).



Graph 1. Initial, 1 Month, and 3 Months MMSE Score.



Graph 2. Initial, 1 Month, and 3 Month GDS Score.

Based on the result of t-pair test, there was influence of 0,002 and significant to 0,001 between initial MMSE score and MMSE after 1 month. While between MMSE 1 month and 3 months there was influence of 0,005 and significant to 0,004 which indicate existence of significant association with level of confidence 95%.

Depression measurement results also showed a decrease in depression level in elderly after using overdenture is the mean value of initial GDS score is 3.5 while mean GDS score after 1 month is 2.67 and mean GDS score after 3 months is 2.17. (Graph 2).

Based on statistical test result with t-pair, there was influence of 0,001 and significant 0,004 between initial GDS value and GDS after 1 month, whereas between 1 month and 3 month there was influence of 0,005 and significant to 0,076 which show significant association with level of confidence 95%.

Discussion

Tooth loss causes a person to choose chewable foods, which can lead to poor nutrition and decrease cognitive abilities, one of which is memory. Losing large amounts of teeth and for long periods of time can cause mental and physical stress. When a person is no longer able to adapt to the stress that occurs, it will cause a state of depression.^{2,4}

A simple process of chewing food is a conscious and unconscious harmonization of conscious, memory, reflexes and other functions as a continuous neural transmission, the tooth plays an important role in which the nerve endings and the sensory receptors can become a coordinated mature and thorough process in the action of mastication-occlusion. If one or more teeth change in function or disappear, the harmony will be affected, causing temporary or long-term vacancies, and causing mental and physical stress.² For that action rehabilitation becomes important to do so that damage does not continue.

Overdenture design using the remaining root tooth as anchorage that can help the stability, support and retention of overdenture artificial teeth, resulting in better chewing and improved mastication function.⁸ MMSE (Mini Mental State Exam) is a usable tool to assess a person's memory status.¹¹ Depression is one of the most common mental illnesses in patients over the age of 60 with no specific symptoms and is difficult to identify so as not to be late or treated. Geriatric Depression Scale (GDS) has been tested and used to measure depression levels in the elderly population.¹²

Research showed that there was a significant improvement in memory quality after

using overdenture for 1 month to 3 months. Full overdenture are complete removable incisors that cover and lean on one or more of the original teeth, root roots, and or dental implants. By maintaining the original tooth element and / or its roots, the benefits are increased stability and denture retention, as well as maintaining sensory and vertical dimensions.^{13,14} As mentioned in the McGill consensus statement, an implant-supported overdenture is currently the standard option for the treatment of edentulous patients. In order to generate a retentive force for overdentures, several types of attachments have been developed. They are mainly classified into splinted anchorage systems such as the bar type, and unsplinted anchorage systems such as the ball type.¹⁵

The chewing efficiency is derived from overdenture retention and stability which provides the degree of satisfaction that allows improvement in mastication. Sensitivity obtained by overdenture can be guaranteed by integrated muscle reaction, which can improve the function of mastication more effectively.¹⁶ Improved mastication function by itself will increase the intake of various nutrients that the brain needs.

Mastication dysfunction causes various morphological changes in the hippocampus and cerebral cortex, including synapses in the hippocampus in the parietal cortex. It has been reported that chewing activity increases oxygen levels in the cortex, thalamus, hippocampus and inferior parietal lobes in the brain which may improve memory capacity in the elderly.⁶ The study of Watanabe in the trial group of adult mice treated with occlusion hypofunction and showed memory decline, but after its occlusion has been restored, its memory function has increased again.¹⁷ Study conducted by Launardo also suggests that there was a significant effect after complete denture (mastication-occlusive rehabilitation) in older people who have lost all their teeth to an increasing memory strength.¹⁸ And also study by Horas suggested that there was a significant increase on elderly memory status after using full overdenture.¹⁹

Depression status of elderly became significantly better as indicated by decreased initial GDS score in the end of 1 month and 3 months after using overdenture. This suggests that by rehabilitating the tooth loss of the elderly by using overdenture it will improve the state of depression in the elderly because the mastication

function worked well. Okamoto et al⁵ reported that the loss of teeth in large numbers leads to higher levels of depression. In other studies using animal experiments it was also reported that the loss of early mastication function leads to chronic malnutrition and stress and affects the ability to recognize new objects.⁶

Davis et al. reported that 40% of participants had difficulty in accepting their tooth loss, they felt less confident and limited themselves from outside activities.²⁰

The relationship between tooth loss, depression and memory is a complex relationship in which all interact, depression can be the cause and effect of memory dysfunction. Someone who suffers from tooth loss, especially in large numbers who suffer from defects in mastication and also appearance. Patients feel embarrassed to meet other people, after rehabilitation using overdenture, patients will become more confident, resulting in improved quality of life, patients who previously more closed from the surrounding environment becomes more excited and more open with others.

The better function of mastication after the use of full overdenture will improve mastication system along with nutrient intake, blood flow to the brain, brain function, as well as memory.

Conclusions

There has been a significant change in memory status of elderly after using full overdenture. Similar to the depression status there was a significant decrease in depression rates in elderly after using full overdenture.

Declaration of Interest

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