

Comparison of Oral Stereognostic Proficiency Between New and Previous Complete Denture Wearers

Saira Ibrahim, Moiza Ijaz, Ammara Sharafat, Samina Younis, Nida Mukhtar, Abdul Mueed Zaigham

ABSTRACT:

Objective: To compare oral stereognostic proficiency scores between new and previous complete denture wearers.

Study design and study settings: This cross-sectional study design was conducted at Armed Forces Institute of Dentistry, Rawalpindi.

Methodology: Total 60 patients belonging to age group of 45–75 years were selected from the study setting. Oral stereognostic proficiency was recorded by using different oral stereognostic intra oral testing tools and scores were noted. Data analysis was done using SPSS (version 20) software. Independent sample t-test was used to compare the scores of new and old previous complete denture wearers. Effect modifier like gender was rectified by method of stratification. Post stratification independent sample t-test was applied and p value of 0.05 or less was considered to be significant.

Results: The mean age of patients was 59.8+7.85 years. Previous complete denture wearers were found to have a higher value as compared to the new complete denture wearers. Significant difference between both groups according to age was found with older individuals having a lower stereognostic value than younger individuals.

Conclusions: Oral stereognostic test is a dependable test to measure patients' oral stereognostic perception which can help the dentist in better educating the patient in terms of his/her expectations regarding the prosthesis and in better understanding the limitations of the prosthesis.

Key words: Complete denture, Proprioception, Stereognosis.

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INTRODUCTION:

Stereognosis, also known as tactile gnosis, is the ability to perceive and identify the shape of an object in the absence of any auditory or visual aid.¹ The form of an object can be appreciated by palpation and by sensory mechanisms without any visual aid. Exploration of shape or form of an object within the oral cavity is termed as oral stereognosis.²

Human brain being a highly specialized tissue has a special area called primary somatosensory cortex, which receives information from the orofacial region via peripheral sensory nerves.³ This area is involved in oral stereognostic coordination and has a wide representation in the classical sensory homunculus in comparison to the rest of the body. This wide representation in the classic sensory homunculus depicts its great importance for oral sensation and function in humans.⁴ Ideal stereognosis can only be achieved if there is an optimal balance between the sensory and motor coordination of the nerves. Sensory stimuli from the tongue, cheek, palate, floor of mouth and surrounding intra oral tissues are transmitted by the trigeminal nerve⁵ which stimulates or inhibits the postsynaptic potentials in nucleus of the hypoglossal nerve, that results in production of motor stimulation to the muscles of tongue.⁶ Any anomaly or

disruption in this sensory information transmission to the nucleus hypoglossal nerve can thus lead to disrupted stereognosis and hence can adversely affect oral physiological activities for example speech and mastication. Oral stereognostic tests have been frequently employed to assess the integrity and balance of this sensory and motor feedback and are used in neurological evaluation resulting in collection of valuable information helping to determine the factors affecting it.⁷

Natural teeth have mechanoreceptors present in the periodontal ligament around tooth roots which provide a precisely sensitive feedback system. Any tooth loss can thus lead to significant deterioration in stereognostic proficiency of oral cavity. Studies have shown that use of complete denture, however can improve this ability to some extent.⁸ This increase in stereognostic proficiency is attributed to the increased ability of individuals to manipulate the objects due to presence of well-fitting upper and lower complete dentures.⁹

In a study conducted by Meenakshi, oral stereognostic proficiency scores were calculated 30 minutes and 1 month after complete denture insertion. The scores were found to have a mean value of 11.33 ± 0.92 in new complete denture wearers (after 30 min of insertion), and 11.86 ± 0.92 in previous complete denture wearer (after one month of insertion). P value was found to be significant as 0.013.¹⁰

Numerous studies have been conducted on evaluation of oral stereognostic proficiency but there is a scarcity in studies comparing the oral stereognostic proficiency between new and previous complete denture wearers. The rationale of this study was to evaluate any significant difference in the stereognostic proficiency between the new and previous complete denture wearers. This study may provide the dentists with a better understanding of oral stereognosis, which can help them in better treatment planning as well as in educating the patients as what to expect during and after wearing of complete dentures with the passage of time.

METHODOLOGY:

This cross sectional study was conducted at the Armed Forces Institute of Dentistry, Rawalpindi, Pakistan. Research was approved by ethical committee of Armed Forces Institute of Dentistry with reference to ERC reference number 905/Trg-ABP1K2/019. Total 60 patients were selected for the study by using WHO calculator. The variables used in sample size calculation included 95% confidence level, 11.33 population mean with 0.92 standard deviation¹¹ and absolute precision of 0.45¹¹. Sampling technique was non-probability quota sampling. Total n=30 males and n=30 females were selected in order to remove gender as an effect modifier. Furthermore, in each gender group, equal divisions of new and previous denture wearers were selected. Inclusion criteria further consisted of selecting patients of age between 45-75years. Patients with existing neurologic deficit, psychiatric disorders

craniofacial anomalies, local disorders/pathologies, and hearing or visual impairments were excluded from the study. Individuals wearing complete denture for the first time or for less than or equal to 1 month were considered as **new complete denture wearer**, and individuals wearing complete denture for more than once month were considered to be **existing complete denture wearers**. Consent from the patients was taken prior to commencement of the study.

Data was collected on a performa which was filled after conducting the oral stereognostic test on each patient. Oral stereognostic test consisted of testing tools made up of autopolymerizing resin in six different shapes i.e. cube, ovoid, cuboid, triangle, sphere and star shaped as shown in Figure 1. Pictures of these testing tools were shown to the patients on a laminated sheet. Afterwards, the patients were asked to keep their eyes closed while the testing tool was placed on the dorsum surface of tongue. Stop watch was started as soon as the testing tool had made contact with the tongue. Patients were allowed freely to manipulate the testing tool in mouth and then were asked to point out the shape which they thought were in their mouth on the laminated sheet. For each of the individual, the six shapes were placed one by one in random order. Time limitation for identification was 60sec. Stereognostic scores were recorded and entered in the data collection proforma. Maximum score of 12 (6 x 2) and minimum score of 0 was possible for one patient. Shape correctly identified was given a score of 2, incorrect identification with closest shape was given a score of 1, and incorrect identification was given 0 score. Mean score was calculated for each patient with the formula. Scores in the range of 0-3 were considered as poor, 4-7 as moderate and 8-12 as excellent. After recording the stereognostic scores, testing tools were taken out of the mouth with the help of tweezers and were disinfected to make it ready for the next person.

Data analysis was performed using IBM SPSS software (version 20). Basis analysis included descriptive statistics of qualitative and quantitative variables. Frequency and percentage was calculated for qualitative variable i.e. gender. Mean and standard deviation was calculated for quantitative variables including age and oral stereognostic score. Independent samples t-test was used to compare the scores of new and old previous complete denture wearers. Effect modifier like age was controlled through stratification. Post stratification independent sample t-test was applied and p value of 0.05 or less was considered to be significant.

RESULTS:

Sixty participants were included in this study with a Mean \pm SD age of 59.8 ± 7.85 respectively. The baseline characteristics of participants are shown in Table-1. The frequency distribution of age of the participants is illustrated in Figure-2.

Mean oral stereognostic proficiency score in complete

denture wearers was found to be moderate i.e. 7.35 ± 2.276 . The oral stereognostic proficiency score was compared between new and previous complete denture wearers using independent samples T-test which showed a significant difference between both the groups. Increased oral stereognostic proficiency was found in previous complete denture wearers as compared to the new complete denture wearers with a p value of <0.001 (Table 2).

Independent samples t-test was used to compare the difference in oral stereognostic proficiency scores between same gender in both the groups. The scores were found to be higher in both males and females previous complete denture wearers as compared to the new complete denture wearers (Table 2). According to age groups, significant difference was found in stereognostic proficiency between aged 45-59 and 60-75 years patients with higher scores reported in younger 45-59 years old age group participants (Table 3). However, no statistically significant difference was noted in scores when both the genders were compared with each other as shown in Table 4

Figure 1 Shapes of Oral Stereognostic

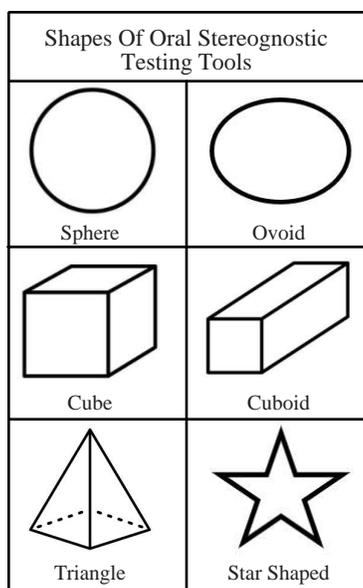


Table 1: Summary of baseline characteristics of study participants (n=60)

Characteristics	Frequency (n)	Percentage (%)
Age in years (mean±SD)	59.8±7.85	
Age range	46-74	
Age groups		
45-59 years	31	51.7%
60-75 years	29	48.3%
Gender		
Male	30	50.0%
Female	30	50.0%

Figure 2: Frequency of age distribution of patients (Age in years)

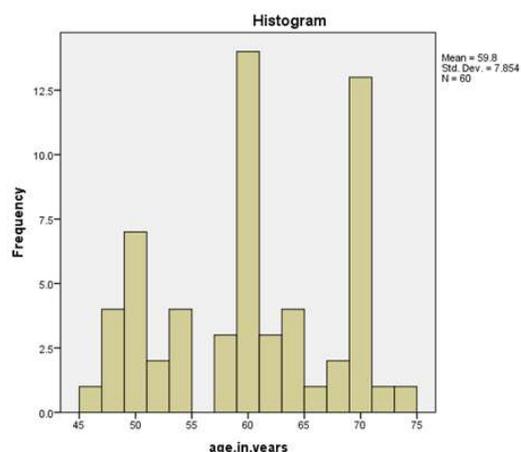


Table 2: Mean Stereognostic proficiency score among study group and comparison of mean score with respect to previous denture experience and gender

		n	Stereognostic proficiency score		p
			Mean	SD	
Overall score		60	7.35	2.276	
Previous denture Experience	Yes	30	9.43	1.63	<0.001
	No	30	5.36	1.84	
Female gender	Old Previous wearer	15	9.33	1.58	<0.001
	New wearer	15	4.93	1.70	
Male gender	Old Previous wearer	15	9.53	1.72	<0.001
	New wearer	15	5.80	1.93	

Table 3: Comparison of Mean Stereognostic Proficiency score between Age Groups in each Gender group

Stereognostic proficiency score		n	Stereognostic proficiency score		p
			Mean	SD	
Female gender	45-59 years	19	8.10	2.42	<0.001
	60-75 years	11	5.45	2.58	
Male gender	45-59 years	12	9.08	2.64	<0.001
	60-75 years	18	6.72	2.19	

Table 4: Comparison of Mean Stereognostic Proficiency score between Male and Females

		n	Stereognostic proficiency score		p
			Mean	SD	
Females	30	7.13	2.76	0.446	
Males	30	7.66	2.61		

DISCUSSION:

In the last two decades there has been an immense improvement regarding materials, methods and advancements in the field of fixed prosthodontics but unfortunately little has changed in the field of removable prosthodontics.¹¹ In regard to complete dentures, the outcome of the treatment is highly unpredictable and patients acceptance of the dentures plays an important role in the success of the dentures. Revisits, readjustments and follow up complaints are frequently encountered. Primary reason for these revisits and complaints are due to the fact of total loss of primary organs i.e. teeth along with their periodontal fibers that are the main proprioceptive units, resorption of alveolar ridge and changes in neuromuscular coordination. Adaptability is a major factor that can improve the neuromuscular coordination and can improve patient satisfaction. This adaptation requires a delicate balance between sensory and motor neurons which is highly variable in different individuals and is affected by a lot of variables.¹² A substantial problem of sensory motor function along with interest in oral perception in general led the researchers to extend the investigation of tactile perception of form intra orally.¹³⁻¹⁵ Majority of the studies conducted focused on determination and comparison of oral stereognostic proficiency of dentate, edentate and comparison between dentate and edentate patients.¹⁶⁻¹⁸ This study was done to compare the result of new and previous complete denture wearers. In this study primarily focused on the manipulation of oral stereognostic testing tools inside oral cavity and assessment of their shape using oral mucosal receptors. Results of this study may help in better understanding of the neuromuscular coordination system in individuals and its relation with better adaptation and success in complete denture treatment.

In the present study, moderate oral stereognostic proficiency value was found in complete denture wearers with a Mean \pm SD value of 7.35 ± 2.276 . This indicates that palatal coverage by the use of complete denture has a positive impact on oral stereognostic proficiency of an individual. These results are in accordance with a study conducted by Bhandari et al who also suggested that stereognostic proficiency increases in edentate individuals after wearing complete denture due to better manipulation of objects and adaptability with time²⁰. Similar results were found in studies conducted by Aken et al and Paulo in which they concluded that the use of complete dentures during the rehabilitation of edentate individuals enhances the oral sensation.^{19,21}

In this study, when results of oral stereognostic proficiency were compared between new and previous complete denture wearers, a significant statistical difference was found with a p value <0.001 . Previous complete denture wearers were found to have a higher value (Mean \pm SD value of 9.43 ± 1.63) as compared to the new complete denture wearers (Mean \pm SD value of 5.36 ± 1.84). This finding is contradictory

with the study conducted by Qureshi AW²² which concludes that there is no statistical difference between new and previous denture wearers. However, findings in this study are in accordance with other studies^{11,14} in which the oral stereognostic proficiency was found to be higher for previous denture wearers¹¹. In a study conducted by Sarapuk V, after one month of wearing of complete dentures, stereognostic assessment was noted to increase by 18.3% and rate of correct identification was increase by 31.5%. These findings may be attributed to the fact that the previous denture wearers had more training and denture wearing time, which in turn resulted in better stereognostic proficiency.^{11,23}

In the present study, patients of a broad age group ranging from 45-75 years were intentionally selected in the study to get more measurable oral stereognostic responses which are in accordance to most of the studies conducted on stereognosis.^{9,11,14,17,18} Significant difference between both groups (45-59 years and 60-75 years) according to age was found with older individuals having a lower stereognostic value than younger individuals. Similar study was performed by Park JH et al to investigate the effect of age on oral stereognosis in 184 healthy adults. Subjects with age in twenties had highest scores (37.42 ± 1.74) whereas those with higher age i.e. eighty plus had lowest scores (20.37 ± 2.99).²⁴ Study by Dr. Divya Dahiya is also suggestive of the fact that as the age increases, OSA tends to decrease significantly.²⁵ Above findings are indicative of the fact that oral stereognostic proficiency diminishes with age. The reason for this finding can be attributed to the fact that there is a decrease in speed of nerve impulse conduction in the sensory fibers with progression in age.²⁶

In the present study, no statistical differences were found when scores of both genders were compared. This finding is in accordance with a study conducted by Leung KC et al study on 45 individuals to find the oral stereognosis level in which no significant differences were reported between males and females ($p=0.614$).²⁷

Results of this study may help in better understanding of the neuromuscular coordination system in individuals and its relation with better adaptation and success in complete denture treatment. Participants with higher oral stereognostic proficiency presumably received more specific sensorial data about objects placed intraorally in comparison to those participants with lesser stereognostic proficiency which can result in better patient satisfaction. Therefore, oral stereognostic test is a valid aid in predicting the adaptability and acceptability of an individual to complete removable dentures. The clinician must pay keen attention and notice the learning skill and capability of the patient to wear the complete dentures. If required, patients should be given certain training to enhance the learning ability of the patient to wear complete denture. Training provided to the patient will improve his oral perceptive skills and the patient will become more responsive to clinical procedures and will

improve patient satisfaction with the prosthesis.

CONCLUSION:

Keeping in view the limitations, it is concluded that the oral stereognostic test is a dependable test which can be used to measure patients' oral stereognostic perception helping the dentist to educate the patient about the future prognosis of the denture and also regarding the prosthesis limitations. Another important finding of this study is that oral stereognostic proficiency of an edentate individual wearing complete denture increases with time which can help the dentists to reassure patients about improvement in oral stereognosis with time.

Authors Contribution:

Saira Ibrahim: Concept, Design, Literature Review, Final Approver

Moiza Ijaz: Literature Review and Collection of Data

Ammara Sharafat: Assembly and Analysis of Data

Samina Younis: Data Interpretation

Nida Mukhtar: Data Analysis

Abdul Mueed Zaigham: Critical Revision of Article for Intellectual Content

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