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Original Research Paper

Prosthodontics

ORAL STEREOGNOSTIC EFFICIENCY AMONG DENTULOUS AND EDENTULOUS PATIENTS

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ABSTRACT

Aim/ Objective: To evaluate oral stereognostic efficiency among dentulous and edentulous patients. **Introduction:** Stereognosis is the ability of the person to identify shape, size, texture, weight of an object using tactile sensations without looking at them. **Methodology:** The study was conducted to examine the difference in oral sensory function by testing the subjects with their oral stereognostic ability (OSA) and to determine the effect of wearing complete dentures on OSA. The OSA tests were conducted with various shapes of wax pellets approved by NIDR for stereognosis. A total of 20 dentate and 20 edentulous subjects free from oral symptoms and pathologies participated in this study. Before starting the study, subjects inclusion and exclusion criteria was informed. **Results:** The answers were recorded using Mc cord and smith three-point scale. ANOVA and paired t-tests were used to examine significant differences. P-values <0.005 were considered to be statistically significant. The OSA score in dentate subjects was significantly higher than in edentate subjects. **Conclusion:** Oral stereognostic ability decreases with age; however, oral sensory function was not significantly different between fully dentate persons and complete denture wearers in the elderly.

KEYWORDS : Stereognosis, wax pellets, oral sensory perception.

INTRODUCTION:

Stereognosis – Ability of a person to recognize size, shape, texture, weight of an object using tactile sensations without looking at them. (Figure- 1)

Edentulism whether it is complete or partial has a long term effect on the systemic health of the individual. Impaired eating and swallowing functions significantly decrease the quality of life (QOL).

In this study, we focused on the ability to recognize the size and shape of items placed in the mouth, and investigated the oral stereognostic ability, aiming at developing a rehabilitation method that targets recovery of the oral stereognostic ability.[1]

AIMS AND OBJECTIVES:

1. To evaluate oral stereognostic ability between dentate and completely edentulous individuals who have been rehabilitated with complete removable dentures and also to study oral perceptive skills to the presence or absence of teeth and to patient evaluation of prosthesis.
2. To determine effect of wearing complete dentures on oral Stereognosis.

METHODOLOGY:

This study was carried out at the department of prosthodontics, KIMS dental college and hospital, Amalapuram.

A total of 40 patients were participated of which 20 patients were dentate with full complement of teeth, except third molars and 20 were edentulous patients, who were edentulous for more than 10 years.

20 wax pellets of different shapes, which were approved by National institute for diagnosis and research (NIDR) for stereognosis were made. American national institute of health has categorized 20 wax pellets of varying shapes into 6 categories (Table-1), of which first category includes polygonal shape which includes wax pellets 1-4, second category includes wax pellets of triangular shape numbered 5-7, third category includes star shaped pellets from 8-10, fourth category includes wax pellets of circular shape from 11-12, fifth category includes convex-shaped group with no corners and the ends swelling convexly numbered 13-16 and sixth category includes concave-shaped group with no corners and a concave middle numbered 17-20 (Figure- 2). These are rated according to smith and Mc cord three point rating scale.(Table-2)

Stereognostic Test Procedure: (figure No: 3)

The test procedure was as follows. The test was carried out between 2:00 and 5:00 p.m. in a quiet room, where the subject was seated comfortably in an upright position. Subjects were told they should use their tongue and palate to identify the shape. They were instructed to respond as quickly as possible and to avoid biting on the test pieces. (Figure- 3)

Pictures of all 20 test pieces were shown to the subject and the corresponding picture was pointed out for each shape. To prevent a learning effect, no practice trials were held. Each of the 20 pieces was presented twice. The 40 presentations were made in random order. Participants were not informed of the correct answers at any point during testing.

With the eyes closed, one of the 20 test pieces was randomly selected and placed on the middle of the tongue. The subject was asked to move the piece in the mouth to determine its shape, choosing the corresponding shape from 2D pictures of the 20 variously shaped test pieces.[2] The test was completed when all 20 test pieces had been evaluated in this manner. The total scores ranges from 0 to 40.

Therefore, the higher the score, the higher the accuracy of Oral stereognosis. To prevent any learning effect, no practice trials were allowed.

RESULTS:

Out of twenty wax pellets which were used to identify stereognostic ability of both dentulous and edentulous patients, it was inferred that star shaped wax pellets was identified correct by 18 edentulous subjects and 20 dentulous subjects.(TABLE-6)

It was also inferred from statistical analysis that cuboidal shaped wax pellets has found to be identified wrong by both dentulous and edentulous subjects. (TABLE-6)

It was found out that P-value is statistically significant among dentulous patients. Mean and confidence intervals are high among dentulous patients according to Table-3.

Table-4 showing scattered graph of stereognostic proficiency among dentulous and edentulous patients and it was found to be high among dentulous patient when a circular wax pellet was placed into mouth.

Table-4 shows stereognostic proficiency was found to be higher among dentulous subjects regardless of shape of wax pellet placed and it was found to be significantly lower among edentulous subjects.

DISCUSSION:

The adaptation of the mouth to a foreign body includes the motor and sensory mechanisms. The motor skills and sensory acuteness show variation from individual to individual.

Oral stereognosis testing has been conducted using test pieces with various complex shapes and forms but with similar dimensions; the patients feel the form and shape of the test pieces placed in the mouth through intra-oral manipulation and compare them with the actual form and shape of the test pieces.

We assessed the stereognostic ability of the tongue by introducing test pieces into the oral cavity, after which the test piece shape was determined by moving it in the mouth without it contacting the teeth or gums.

Evaluating oral stereognostic levels in subjects of different age groups and in subjects with and without dentures may not only provide useful information about sensory ability of the denture subjects but may also aid in relating age to the success of the denture.

The stereognostic tests as employed in this study do not require any complicated equipment. They are easy to carry out, do not require much time and are not objectionable to the patients.The older the subjects, the more frequently they misidentified test pieces in othergroups rather than in the same group.

The correlation between response times and oral stereognosis test scores explained by the fact that oral perception of the size and shape of a bolus declines with age, irrespective of dental status, due to a decrease in information from the tongue and palate. As a result, older adults have difficulty in distinguishing complex shapes. Second, OS involves some motor activity of the lips, tongue, and teeth.

Motor activity tends to be reduced with age, thus impacting on the test score. In this study, younger subjects had shorter response times than older subjects, suggesting that aging negatively impacts on OS in terms of the speed in Which sensory information is processed.

This is because the conduction speed of nerve impulses in sensory fibers decreases with age. In addition, sensory inputs are used for comparison with previous sensory memories to identify of the shapes of test pieces. Cognitive functions including memory normally decline as a result of aging, beginning from middle age. Thus, these changes may negatively affect response time.

With the following study done, oral stereognostic ability decreases with age; however, oral sensory function was not significantly different between fully dentate persons and complete denture wearers in the elderly.

In a study conducted by Jin-hyuck park, on changes in oral stereognosis of healthy adults by age, they found out that the younger group had higher test scores and shorter response times than the older group, except for comparisons between the 20s and 30s age groups. These results indicate that oral stereognosis decreases with age.

Grasso RE et al., studied oral sensory ability of stereognosis, in both young and old subjects with and without palatal coverage. According to them, there are no significant differences in oral stereognostic ability between subjects with and without full palatal coverage. However they suggested that age plays an important role in oral stereognostic ability. In older subjects oral stereognostic score was lower than younger and had slightly longer recognition time.

Table-4 shows stereognostic proficiency was found to be higher among dentulous subjects regardless of shape of wax pellet placed and it was found to be significantly lower among edentulous subjects.

Very few studies have been carried out so far to evaluate the normal and individual level of oral perception and its relation to the success of prosthodontic treatment.

Clinical Implications:

1. It has a role in the complex process of incorporating and accepting rehabilitation with complete removable dentures.
2. It helps in adaptation and adjustment to CD prosthesis.
3. It helps in understanding sensory–motor relationships.
4. It helps in delivering transitional appliances in patients with poor senso- motor cognition.
5. Patients with high level of oral perception may be more responsive to clinical procedures.

CONCLUSION AND SUMMARY:

The results of this study lead to the following conclusions:

(i) Oral stereognostic ability decreases with age; however, oral sensory function was not significantly different between fully dentate persons and complete denture wearers in the elderly.

(ii) An age-related difference in oral sensory function, as measured by OSA tests, was found.

Hence, oral stereognostic ability has been proved to be better in dentulous subjects according to statistical analysis.

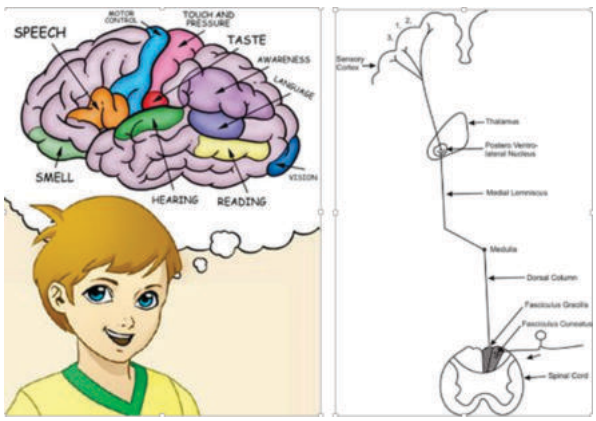

Figure-1 Mechanism Of Action Of Stereognosis

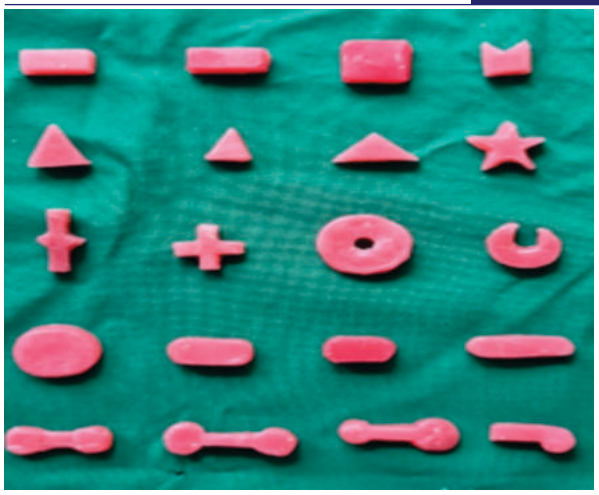

Figure- 2 20 Test Pellets Made Of Wax (NIDR Shapes)

Figure -3 Stereognostic Test Procedure

Table No: 1

AMERICAN NATIONAL INSTITUTE OF HEALTH
Polygonal-shaped group (nos.1–4)
Triangular-shaped group (nos. 5–7)
Star-shaped group (nos. 8–10)
Circular-shaped group (nos. 11, 12)
Convex-shaped group with no corners and the ends swelling convexly (nos. 13–16)
Concave-shaped group with no corners and a concave middle (nos. 17–20).

Table No: 2

Smith and McCord three point rating scale
Correct identification of the shape of a test piece is scored as two points
Incorrect identification of the shape of a test piece in the same group is scored as one point
Incorrect identification of the shape of a test piece is scored as zero.

Table No: 3

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	LRD - LRE	-.20000	1.23969	.27720	-.78019	.38019	-.721	19	.479
Pair 2	SRD - SRE	.15000	1.26803	.28354	-.44346	.74346	.529	19	.603
Pair 3	SQD - SQE	.05000	.68633	.15347	-.27121	.37121	.326	19	.748
Pair 4	POLD - POLE	-.45000	1.60509	.35891	-1.20121	.30121	-1.254	19	.225
Pair 5	LTD - LTE	.15000	.93330	.20869	-.28680	.58680	.719	19	.481
Pair 6	STD - STE	.30000	.80131	.17918	-.07503	.67503	1.674	19	.110
Pair 7	FTD - FTE	.25000	.63867	.14281	-.04891	.54891	1.751	19	.096
Pair 8	SSD - SSE	-.25000	.91047	.20359	-.67611	.17611	-1.228	19	.234
Pair 9	RHD - RHE	-.45000	1.35627	.30327	-1.08475	.18475	-1.484	19	.154
Pair 10	PLD - PLE	-.25000	1.55174	.34698	-.97624	.47624	-.721	19	.480
Pair 11	CID - CIE	.20000	2.04167	.45653	-.75553	1.15553	.438	19	.666
Pair 12	COD - COE	-.05000	1.46808	.32827	-.73708	.63708	-.152	19	.881
Pair 13	CUD - CUE	-.15000	.67082	.15000	-.46395	.16395	-1.000	19	.330
Pair 14	LACUD - LACUE	.20000	1.10501	.24709	-.31716	.71716	.809	19	.428
Pair 15	FLCUD - FLCUE	.25000	1.25132	.27980	-.33563	.83563	.893	19	.383
Pair 16	FLCID - FLCIE	-.15000	.87509	.19568	-.55956	.25956	-.767	19	.453
Pair 17	LDD - LDE	-.15000	1.63111	.36473	-.91338	.61338	-.411	19	.685
Pair 18	SDD - SDE	-.45000	2.81864	.63027	-1.76916	.86916	-.714	19	.484
Pair 19	FLD - FLE	-.10000	.71818	.16059	-.43612	.23612	-.623	19	.541
Pair 20	OSDD - OSDE	.10000	.44721	.10000	-.10930	.30930	1.000	19	.330

Table No: 4

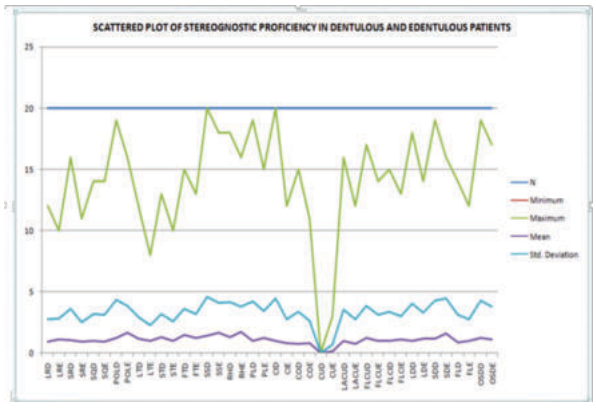

Table-5 Subject Responding Scale To Samples

	Large rectangle		Small rectangle		Square		Polygonal		Large triangle		Small triangle		Flat triangle		Star shape		Rhomboidal		Plus shaped	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Large rectangle	10	10	2	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small rectangle	2	6	16	11	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Square	3	6	3	2	16	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonal	1	0	0	0	0	0	16	16	0	0	0	0	0	0	0	0	0	0	0	0
Large triangle	0	0	0	0	0	0	0	0	12	12	4	2	4	2	0	0	0	0	5	5
Small triangle	0	0	0	0	0	0	0	0	3	3	13	13	4	3	0	0	2	2	0	0
Flat triangle	0	0	0	0	0	0	0	0	2	3	3	2	15	13	0	0	0	0	0	0
Star shape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	16	0	0	0	1
Rhomboidal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	16	16	0	2
Plus shape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	15	15
Round	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1
Cuboidal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Less cuboidal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flat cuboidal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flat circular	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large dumbell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small dumbell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flat dumbell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
One sided dumbell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table-6 Subject Responding Scale To Samples

	Circular		Convex		Cuboidal		Large cuboidal		Flat cuboidal		Flat circular		Large dumbell		small dumbell		Flat dumbell		One sided dumbell	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Large rectangle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small rectangle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Square	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large triangle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small triangle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flat triangle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Star shape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhomboidal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plus shape	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Round	20	12	0	5	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Convex	0	0	15	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cuboidal	0	4	0	0	0	0	16	12	4	1	0	3	0	0	0	0	0	0	0	0
Less cuboidal	0	0	0	0	0	0	1	3	17	14	2	3	0	0	0	0	0	0	0	0
Flat cuboidal	0	0	0	0	0	0	2	0	3	1	15	13	0	5	0	0	0	0	0	0
Flat circular	0	0	0	0	0	0	0	0	0	3	2	3	18	14	0	0	0	0	0	0
Large dumbell	0	0	0	0	0	0	0	0	0	0	0	0	1	0	15	16	0	2	0	0
Small dumbell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	13	2	3	3
Flat dumbell	0	0	0	0	0	0	0	0	0	0	0	0	1	4	3	2	14	12	2	2
One sided dumbell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	13	17

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