Original Research Article

Oral Stereognosis in Edentulous patients in South Indian Population

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Abstract: The ability to predict patient's performance with complete dentures remains elusive, irrespective of the method and the level of clinical proficiency employed in the fabrication of the prosthesis as some patients with clinically acceptable complete dentures function well while others poorly. The patients for this study were selected from those treated by the staff of the department of Prosthodontics, College of dental Surgery, Manipal and also those treated under the supervision of senior staffs of the Department. The patients were thoroughly examined to rule out any oral pathosis that right influence in the influences of this devaluation. A detailed history was then taken to standardize the patients. Patients who were under the influence of drugs, drug addicts, intoxications, sedatives, psychic and with perverted habits were not included in the study. A total of 66 patients were subjected to this perception study. They were divided into two groups A and B. group A ranged in age from 30 to 55 years and Group c between 56 to 80 years. Group A consisted of 31 (males 8 & females 23), patients and Group B 35 (males 28 & ladies 7) patients.
Keywords: Edentulous, oral stereognostic, neuro muscular reflexes.

INTRODUCTION

The ability to predict patient's performance with complete dentures remains elusive, irrespective of the method and the level of clinical proficiency employed in the fabrication of the prosthesis as some patients with clinically acceptable complete dentures function well while others poorly. The degree of success of patient's performance can be attributed in part to tissue tolerance to dentures, but the saccors of sensory feed-back and neuroscular control relating to the manipulation of these prostheses are more significant since the physiologic function of the masticatory system is primarily dependent upon the integration of sensory feedback and motor neuron response. The sensory feedback is carried out by the neural receptors in the form of proprioception, nociception and perception present in the periodontal membrane and other oral tissues [1].

Therefore, the successful use of complete dentures eventually depends on the neuromuscular adaptation of patients. It is believed that in a person with natural teeth, occlusal sense depends upon signals from receptors in the periodontal membrane that mainly provide proprioception anti nociception. Accordingly during chewing and other[2]. This neurological apparatus of proprioception and nociception which acts as a relaying media is destroyed when the teeth are extracted and therefore missing in the edentulous patients. Hence, the persons wearing complete dentures lack tactile sensations derived from the periodontal membrane.

This prompted undertaking the present study involving oral stereognosis in edentulous subjects, so as to compare the perceptive abilities of the subjects with and without complete dentures. The study also compares the levels of oral discriminatory skills to age, sex, the period OT wearing dentures and the role of patient's satisfaction with their dentures to their stereognostic ability [1]. It has been further contemplated that the rehabilitation of the edentulous patients may improve the sensory perception in the oral cavity and that the perceptive abilities may decrease with advancing age and may increase with the period of wearing dentures.

MATERIALS AND METHOD

This particular clinical study was undertaken to compare the oral stereognostic abilities in the levels of perception in the edentulous subjects and also to investigate the levels of oral discriminatory skills to age, presence or absence of complete dentures, the period of wearing dentures and the role of patient's satisfaction with their dentures to their stereognostic abilities. The neurolociical evaluation of central nervous system integrity frequently employs stereognostic test i.e. tactile kinesthetic recognition of forms without the aid of vision. The patient was required to identify familiar objects by hand manipulation as well as ori.dly with and without the artificial dentures, not aided by visual -perception.

Materials:

The patients for this study were selected from those treated by the staff of the department of Prosthodontics, College of dental Surgery, Manipal and also those treated under the supervision of senior staffs of the Department. The patients were thoroughly examined to rule out any oral pathosis that right influence in the influences of this devaluation. A detailed history was then taken to standardize the patients. Patients who were under the influence of drugs, drug addicts, intoxications, sedatives, psychic and with perverted habits were not included in the study

A total of 66 patients were subjected to this perception study. They were divided into two groups. A and B. group A ranged in age from 30 to 55 years and Group c between 56 to 80 years. Group A consisted of 31 (males 8 & females 23), patients and Group B 35 (males 28 & ladies 7) patients (Table II).

Patients were selected irrespective of their caste, creed, colour and socio-economic status. the test forms used in this investigation more or less based on the test forms used by harold Litvak *et al.;* 14 and consisted of 10 different forms in order to evaluate the patient's ability to differentiate and distinguish the various objects of different shapes and surface alterations.

All the ten test forms were divided into two series. In one series, five forms with their respective enlargements, which are approximately five times larger, represented varying alterations in basic shapes. These five forms (photograph No.3) at_ as follows:
1. Cylindrical
2. Heart shaped
3. Triangular
4. Step or L shaped
5. clubs shaped

The second series of another five forms with their enlarged duplicates (approx. five times) represented varying degree of alterations, these are
6. Circular
7. Square
8. Triangular
9. plus or cross
10. Star shaped

All these forms were constructed of heat cure acrylic, for testing manual and oral perceptions. In the construction of smaller test forms, cubes of approximately 7-8 mm. were made using blue inlay wax and block former. These were then reduced precisely to 5 mm cubes using microtome.

Now the blocks of 5 cubes were chiseled and carved precisely into above mentioned ten forms. Then the wax patterns were flasked, processed and finished with neat cure acrylic resin using crown flask (buffalo type). In the construction of bigger visual or reference forms (which were approximately five times larger than the test forms) wax blocks of 30 mm cubes were first made using paraffin wax and block former. Those were then reduced precisely to 25 mm. cubes using Microtome. These blocks of 25 mm cubes were then chiseled and carved similarly and precisely in order to duplicate the test forms. Wax patterns were then flasked, processed with heat cure acrylic resin and finished & polished using 'Hanau type' twin flask. These larger visual or reference forms along with the charts -lapicting the same forms (Fig. No.1) were kept forth for purposes of identification in front of the patient and remained fully accessible as a visual aid throughout the test period.

Method:

Each patient was seated comfortably and care was taken to minimize any external distractions. Before the commencement of the test, the aim of the study and the procedures were fully. Explained to the patient and due written consent of the patient was obtained for full co-operation the test forms were concealed from the subject and the following random order of presentation of the test pieces were followed for all the patients in the shape and surface alterations respectively.

In shape alterations
- heart shaped
- Step or L shaped
- triangular '
- cylindrical
- club shaped

In surface alt. Rations
- Triangular
- Square
- circular

- star shaped
- 10) Plus or cross.

The manual test was performed first. This test was essentially a training exercise in order to make patient familiarized and also as control mechanism to screen for any gross abnormalities in the stereognostic abilities. Each subject was handed one of the forms as per the order mentioned above under cover. by means of digital manipulation attempts to identify the shape by pointing to matching reference form and picture on a chart (Photograph No.5) depicting all ten forms were to be done within a given period of 30 seconds,

The results of the identifications were not disclosed till the end of all the tests was performed. After the forms were presented for manual detection, the oral tests were performed. each test form was placed on the extended tongue (Photograph No.7) and then taken into the mouth in the same order as the manual testing, he or she was instructed to move the form .around or do anything with the test forms which might help him or her in identification eg: sucking, crewing, pressing against palate or lips and to int to one of the reference forms, as soon as the oral identification of the stimulus was achieved, the test form was placed for not more than 30 seconds.

Scoring was 5 points for each correct answer with a maximum score of 50 for all the 10 test forms, 3 scores were given for a partially- correct answer. for example among shape alterations:

- cylindrical anti heart shaped
- Heart shaped and clubs shaped
- triangular and step or L shaped

And for example among surface alterations:
- Square and triangular
- plus or star shaped

Oral test was performed twice in each subject first without the complete dentures in place and later with the complete dentures in place after a lapse of time of 15 minutes, observing all aspects. For wrong identification zero score was given. The scores thereby obtained was checked.by repeating all the tests thrice and the relative scorings were registered as per the above mentioned criteria in the stereognostic score chart for each patient.

At the time of stereognostic testing, the evaluation of the patient's view point of denture performance was noted. The subjects were classified according to their subjective comments on their present dentures in relation to mastication, spch, aesthetics, past denture history etc. From the patients' attitude, towards the dentures, the subjects were classified by oral acceptance of the dentures into following four types:

Type I. Patient satisfied with no complaints
Type II. Patient satisfied with few complaints (less than 5 complaints)
Type III. Patients satisfied with: any complaints (more than 5 but less than 10 complaints)
Type IV. Patient's dissatisfied with the dentures (having more than 10 complaints)

This evaluation was compared with oral stereognostic scorings to see if any significant correlation exists

RESULT
A total number of 66 patients have been subjected to this perception study. Table II shows that out of a total of 66 patients are divided into two age groups of A & B. Group A is of the age range of 30-55 years and on the other hand group B between 56-80 years. Group A consists of 31 number of patients which comprised 46.9% of the total patients, out of which males are 8 and females are 23 in number with 12.12% and 34.85% respectively. Group B consists of a total number of 35 patients making up the remaining 53.03% of which males are 28 or 42.42% and females 7 in number or 10.61%. On the whole, a total number of 36 males and 30 females i.e. 54.54% and 45.46% in both the age groups were tested.

Table III shows the comparison of stereognostic scores in edentulous subjects. While comparing the mean stereognostic scores between the age groups A and B (30-55 years and 56-80 years a significant difference of P<0.005 may be noted when compared with manual Vs without complete dentures, in the age group of 30-55 years only. However, no significant difference in the stereognostic scorings was noticed in the age group of 56-80 years P >0.05. It may be further seen from Table III that the difference between mean scores of manual Vs complete denture wearing is highly significant in both the age groups A& B as P<0.001 and P<0.005 respectively. Furthermore, the difference between the mean stereognostic scores when compared with and without complete denture wearing shows significance only in the age group of 30-55 years as P<.: 0.025. While there is no significance in the higher age group as P is>0.05.

Table IV shows the mean + S.D. of stereognostic scores under different conditions in two age groups with the following statistical inferences, wherein the difference between the mean score between the age groups of 30-55 years and 56-8O years in manual scorings is statistically highly significant as P is 0.001. It may also be noted that the scorings are highly significant when compared without complete dentures

and with complete denture wearing as P <0.001 and P4 (0.005 respectively.

The scatter gram (Figure 3) demonstrates the stereognostic scorings with the period of denture wearing and shows a positive relation-ship between the period of wearing dentures and stereognostic scores (r = + 0.48). This relationship is found to be highly significant (t = 4.38 & P<0.001).

Table V depicts the mean + S.D. of stereognostic scoring with different age groups and sex. It may be observed that when the mean stereognostic scores are compared between the two sexes in each age group, the difference found is statistically insignificant as PI> 0.05 in both the age groups. The same can also be observed from the figure No.2 which shows that in age group A the mean stereognostic score. Males is 40.13 and in females 41.96. Whereas in the case of B age group, the mean stereognostic score in males is 32.61 and in females 37.14 (Table V and figure 2).

The figure 4 presents the mean stereognostic scores by patient acceptance of dentures, as being Type I (patients satisfied with dentures with no complaints), Type II (patients satisfied with dentures with few complaints i.e. upto 5 complaints) and Type III (patients satisfied with dentures with many complaints i.e. from 6 to 10 complaints). Which is further clarified from Table VI which shows the distribution of subjects according to the age group as per their complaints of different types. It may be noticed that group A consists of 3 patients in Type I, 9 patients in Type II and 19 patients in Type III with 4.54% , 13.64% and 28.79,. Respectively making a total of 31 patients. However, in the case of group B (56 to 80 years) 11 patients fall in Type I, 18 in Type II and only 6 in Type III making a total of 35 patients or 53.03%. Out of the total 66 subjects tested 14 or 21.21% fell in Type I, 27 or 40.91% in Type II and 25 or 37.83%, in type III respectively. Figure 4 shows the Type I patients with no complaints nave lowest mean stereognostic score (24.79), Type II patients have a higher wean stereognostic score (38.46) and the Type III patients have the highest mean stereognostic score (43.96).

Table I: Stereognostic Score Chart

Test forms			
Shape /alterations 1.cylindrical 2.heart shaped 3.triangular 4.step or L-shaped 5.club shaped			
Total score Surface alteration 1.circular 2.square 3.triangular			
4.plus or cross 5.star shaped			
Total score Sum total of score of shape and surface alterations			

Table II: Distribution of the patients in the different age groups and sex

Age Group	Male	% age	Female	% age	Total	% age
35-55 yrs	8	12.12	23	34.85	31	46.97
56-60 yrs	28	42.42	7	10.61	35	53.03
Total	36	54.54	30	45.46	66	100.00

t= student 't' test   H.S. = highly significant   vs = versus
P= probability level   N.S. = non-significant
Table IV
Mean ± S.D. of stereognostic scores under different conditions in different age groups and statistical interferences.

Table III: Comparison of stereognostic scores in edentulous subjects within the age groups

Age Group	Stereognostic scores		
	Manual	Without complete denture	With complete denture
30-55 years	32.80±6.12	37.76±6.50	42.16±7.39
56-80 years	25.57±7.56	29.29±8.69	33.09±9.59
't'	4.24	4.54	3.11
P value	P<.001 H.S.	P <.001 H.S.	P<.005 H.S.

S.D. = Standard deviation   P= probability level
'T'=student't' test   H.S. = highly significant

Table V: Mean ± S.D. of stereognostic scoring with different age groups and sex

Age Group	Male Mean ±S.D.	Female Mean ± S.D.	t	P
30-55 yrs	40.13 ± 7.90	41.96 ± 7.85	0.567	P >.05 N.S.
56-80 yrs	32.61 ± 8.84	37.14 ± 9.88	2.20	P >.05 N.S.

S.D. = standard deviation   t = student't' test
N.S. = not significant   P= probability level

Table VI: Distribution of subjects according to the age groups as per complaints

Age Group	Type of complaints							
	Type I (0)		Type II (0-5)		Type III (6-10)		TOTAL	
	No.	% age	No.	% age	No.	% age	No.	% age
30-55yrs	3	4.54	9	13.64	19	28.79	31	46.97
56-80 yrs	11	16.67	18	27.27	6	9.09	35	53.03
Total	14	21.21	27	40.91	25	37.88	66	100.00

DISCUSSION

Successful treatment of edentulous patients with complete dentures includes a period of training and relearning of .existing neuromuscular reflexes and behaviour patterns [3]. The attainment of maximum chewing efficiency eventually depends on the neuromuscular adaptation of patients. The physiologic function of the masticatory system is primarily dependent upon the integration of sensory feedback and motor neuron response. Proprioception and perception are the sensory processes that act to programme and monitor the motor response. The normal activity of muscle is dependent upon afferent impulses originating in proprioceptors recording changes in muscles, tendons and joints. The observations also compare the levels of oral discriminatory skills to age, sex, the period of wearing dentures and the patient's acceptance of their dentures [4].

Almost all the investigators in the field of oral sensation and perception agree that the most promising method for evaluating the same is the oral stereognostic test. Accordingly, the designing of the test forms used in the present study had basic alterations in shape and also differences in the surface of the test forms in order to obtain a more accurate picture of the discriminatory skills of a patient which was also advocated by Harold Litvak *et al.;* [1] the results of this study seem to indicate that age is a factor that might account for the differences in stereognostic ability of the patients as an inverse relationship was seen, that is, a decrease in the levels of perception as the age increases [1,2,5-7,8-16].

The presence of a highly significant (as shown in Table III under conditions of with and without dentures) stereognostic score of P<0.025 in the age group A (30-55 years) as compared to a lack of significant score P >0.05 in the group b (56-80 years)

clearly indicates that the degree of perception decreases as the age advances[1,8,16]. The above findings may be attributed to a number of factors that are to play a role in lowering of the sensory and motor activity in the older groups of subjects above 56 years of age, leading to lowering of the stognostic score. furthermore, it is also likely that the ie., patients belonging to the older age group (b) showed poor perception as a result decline in memory ,which is established to be associated with aging as evidenced by wright. Moreover, it may also be due to the reduction in the number of nerve endings in the anterior part of the palate, which is also supported by Peter F. Taylor [17].

Since the stereognostic scores were significantly higher in the younger age group when both dentures were in place, indicating clearly that the rehabilitation of the edentulous patients of younger age group (A) by means of properly fabricated complete dentures, does contribute to a certain improvement in oral sensory functions. The same was not significant at all in the case of patients of older age groups (B). The improvement in perception with the complete dentures as compared to without dentures in the younger age group can be explained on basis of the fact that an edentulous patient loses the integrity of the stomatognathic system (jaw organs) after the loss of natural teeth, which is likely to be restored by providing the well fabricated complete dentures, thereby helping the sensory and motor system for better perception. This may not be true to the same extent in the older age group due to the effect of senescence, affecting the sensory and motor capabilities. This is in conformity with the findings reported by Harold Litvak [1].

The findings of more accurate oral perception (table IV) with complete dentures (P<0.005) and without complete dentures (P<0.001) as compared to manual perception (P<0.001) could be justified on the basis of tactile perception which has been reported to be more sensitive in the tip of the tongue than in the tips of the fingers as also reported by Grossman, R.C [12].

The comparison of mean stereognostic score for different age groups in the two sexes failed to reveal any significant differences as P>0.05 in both the groups (table V and Figure 2) indicating thereby that sex does not play any role for the given age group as far as perceptibility is concerned. However, it is interesting to note (Figure 3) that the stereognostic scores, pertaining to the period of denture wearing revealed positive relationship as r = +0.48 which was highly significant t = 4.38 and. P<0.001. .therefore it is amply clear that the neuromuscular adaptation Is directly proportional to the length of denture wearing resulting into improved perception. This is Further .substantiated with the findings of Anzelm Langer and Julius mitchman and hetoid Litvak *et al.;* [1-2].

SUMMARY AND CONCLUSION

The following conclusions are drawn from this study:

1. The level of oral perception was higher in the younger age group as compared to older age group.
2. No significant difference in the level of perception was observed between the subjects of 56 years and above with and without complete dentures.
3. The oral perception was superior in the edentulous subjects when both the maxillary and mandibular dentures were in place than without dentures.
4. There was no appreciable difference in the oral perceptions between the either sexes in different age groups.
5. The level of perception was found to be directly proportional to the period of wearing dentures.
6. The level of perception was also found to be directly proportional to the number of complaints the patient had with their complete dentures.
7. On the basis of the study it can also be recommended that oral stereognostic tests can provide information related to oral discriminatory skills of a patient. They can be administered in a short period of time and require no exceptional and specialized clinical proficiency.

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