RESEARCH ARTICLE

COMPARATIVE EVALUATION OF ORAL STEREOGNOSTIC ABILITY IN COMPLETE DENTURE AND OVER DENTURE SUBJECTS -AN IN VIVO STUDY

*Dr. Priyanka Rathod

Post Graduate Student, India

ABSTRACT

Aim: Evaluation of the oral stereognostic ability of complete dentures patients over patients wearing over dentures. **Study design:** The study is an in vivo comparative study. **Materials and Methods**: In the present study, oral stereognostic tests were carried out on 20 subjects. Out of the 20 subjects 10 patients were complete denture wearers and 10 patients were overdenture wearers. For each patient oral streognostic test was done without the denture and with the denture. The patients were blindfolded and one random test specimen was placed on the mid dorsum of the tongue. Stopwatch was started as soon as the test piece made contact with the tongue. Subjects were allowed to freely manipulate the test piece in the mouth. Within a 15 second patient had to point to the shape on the paper sheet .Then all six test specimens were presented in the random order. Scores were given. Then patient is asked to wear a complete denture and same procedure is followed. **Results:** Data obtained from oral stereognostic ability test were statistically analyzed and found out that stereognostic test ability in overdenture was significantly more than complete denture. **Conclusion:** We concluded that patient using overdenture have better stereognostic abilities than complete denture.

INTRODUCTION

As age advances various changes occurs in human body. Oral cavity is not an exception. Our senses are responsible for major functioning in our body such as mastication, swallowing and degglution are utmost important for healthy body as energy comes in the form of food. All this function occurs in coordination with receptors present in oral mucosa, PDL and brain. Some oral proprioceptors with sensory nuclei originate in the fiber present in periodontal ligament and help in the perception of food texture, particle size and maxilla-mandibular relationship. In various researches shown that neural connection exist between periodontal sensory nuclei, cranial nerve V and masticatory muscles. Thus it helps in perceiving maxilla-mandibular relationship and proprioception more precisely in dentulous patients than edentulous patients as they lose dentitions.[1] Hence we can call oral stereognosis (OS) as the neurosensorial ability of the oral mucous membrane to recognize and discriminate the forms of objects in the oral cavity.

It can be classified according to the following:

Homostereognosis: self-body recognizing capacity, like teeth, tongue and palate

Organ stereognosis: capacity to recognize muscular units as target areas, concomitant to conscious projection of organism in environment (position of limbs to execute routine tasks)

Heterostereognosis: capacity to recognize foreign body inside oral cavity (glass particles or wood stick).[2] In this study we evaluated the difference between oral stereognosis capacity of complete edentulous patients wearing complete dentures and patients with overdentures.

MATERIALS AND METHODS

- The edentulous patients who have been wearing maxillary and mandibular complete denture and partially edentulous patients wearing maxillary and mandibular overdenture reportedfor follow up to the department of Prosthodontics, MGV'S K.B.H. Dental College and Hospital, Panchvati, Nashik were considered in the study.

- Oral stereognosis tests (OST) were conducted on 20 complete denture patients (conventional and over denture) in the age group of 50–70 years and have been wearing the prosthesis for more than 3 months.
- Shapes chosen for stereognostic tests were as follows-
- 1)Triangle,   2) Square, 3) Circular ,4) Star, 5) Hexagonal, 6) Ring [fig.1]

Fig. 1 Different shapes of test specimens In this image six types of shapes made from cold cure acrylic resin was showed

The shapes were first made in wax. These shapes were flasked, dewaxed and packed with heat cured acrylic resin. The shapes were then finished and polished with sand paper.

In first group: The test was carried out in a quiet environment.Subjects wereasked to seat comfortably in an upright position.Patients were asked to remove the denture. Nospecimens were shown to patients.Patients were blindfolded and one randomtest specimen was placed on the mid dorsum of the tongue of patient [Fig.2]. Stopwatch was started as soon as the test piece made contact with the tongue. Patients were allowed to freely manipulate the test piece in the mouth and asked to identify the shape. Paper sheet having different shapes was given to the patients.

Fig. 2. Acrylic shape in patient's oral cavity In this image, one by one each shapewas placed into patient's oral cavity without showing them

Within 15 seconds patientsasked to point to the shape on the paper sheet [Fig.3]. And scores were given. Only two scores were given if patient identified the shape right on score sheet with all shapes drown on it then 2 score were given, if patient failed to identify or identified wrong shape on score sheet then 0 scores were given. Then all six test specimens were presented in the random order and scores were given and calculated. After that patient was asked to wear acomplete denture and same procedure was followed. Scoring was given and calculated. After using all the shapes in one patient these acrylic shapes were cleaned thoroughly with soap and water and pat dried before using it in next patient to prevent the contamination.

Fig. 3. Patient identifying shape on score sheet. In this image, after placing shapes into patient's mouth, patient was asked to identify the shape by showing it on score sheet

In second group: Same procedure was followed as in first group in two steps without overdenture and with overdenture and scores were given. Likewise all the scores were calculated and statically analyzed.

Example of score sheet

RESULTS

All the data obtained from oral stereognostic ability test were statistically analyzed.

- In this study Frequency (Qualitative data) was represented using percentage. Probability $P< 0.05$, conseder as significant as alpha error sets as 5% with confident interval of 95% set in the study. Power of the study was set at 80% with beta error set at 20%
- From above tables and graphs we can appreciate that stereognsotic test ability in over denture wearers was significantly better than complete denture wearers.
- Hence we can conclude that patient using over denture have better prognosis.

Table 1. Comparison of oral stereognostic ability in both subgroups of group i (complete denture) correctly identified 6 different shape

	Shapes not identify N (%)	Shapes correctly identify N (%)	Chi square test	P value, significance
Subgroup ia (without complete denture) N =10 (*6 shapes)	38/60 (63.3 %)	22/60 (36.6 %)	Chi = 21.07	P =0.014*
Subgroup ib (with complete Denture) N =10 (*6 shapes)	21/60 (35 %)	39/60 (65 %)		

*p<0.05 – significant

**Table 2. Comparison of oral stereognostic ability in both subgroups of group ii (overdenture).**

	Shapes not identify N (%)	Shapes correctly identify N (%)	Chi square test	P value, significance
Subgroup iia (without overdenture) N =10 (*6 shapes)	36/60 (60 %)	24/60 (40 %)	Chi = 46.37	P <0.001**
Subgroup iib (with overdenture) N =10 (*6 shapes)	12/60 (20 %)	48/60 (80 %)		

**p<0.001 – highly significant

Table 3. Comparison of oral stereognostic ability between group ib (complete denture) and group iib (overdenture) who correctly identified different shapes

	shapes not identify n (%)	shapes correctly identifyn (%)	chi square test	p value, significance
subgroup ib (with complete denture) n =10 (*6 shapes)	21/60 (35 %)	39/60 (65 %)	chi = 12.69	p =0.048*
subgroup iib (with overdenture) n =10 (*6 shapes)	12/60 (20 %)	48/60 (80 %)		

*p<0.05 – significant
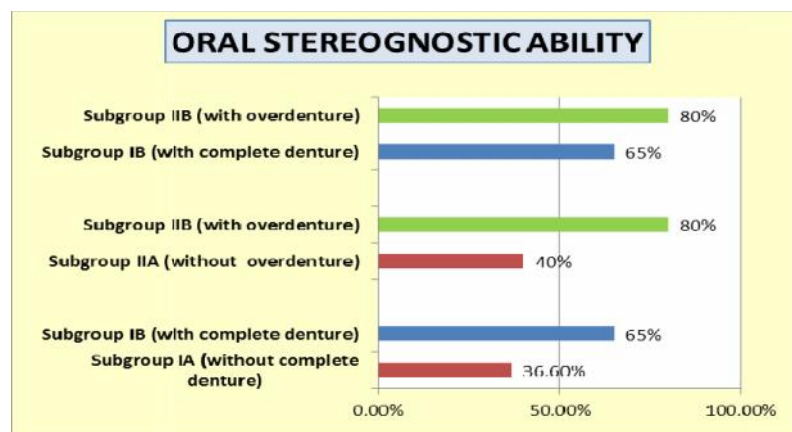
Graph 1. Oral stereo gnostic ability between complete denture and over denture

DISCUSSION

Oral cavity contain variety of receptors namely mechanoreceptors, proprioceptors and nociceptors which meet inside the mouth to transduce various stimuli into electrochemical signals of the brain. Mechanoreceptors in the mouth detect tactile sensations, which is the basis for oral stereognosis. They transmit signals such as touch, pressure and proprioception to the brain via electrical signals. The oral tissues such as tongue, cheek, gingiva, periodontal ligament and the palate are richly innervated by these mechanoreceptors. Merkel's disks, Meissner's corpuscles, Ruffini endings and Pacinian corpuscles are the four primary kinds of tactile mechanoreceptors. The sensory nerves supplying to these mechanoreceptors provide substrate for any sensations in the oral mucosa. The oral tactile information, which is key to OSA, is transported to the brain via the trigeminal nerve and ends at the thalamus and cortex. The middle portion of the palate has sparse presence of mechanoreceptors than its posterior part, especially near the anterior uvula.

Furthermore, the periodontal ligament supporting the teeth, are attributed to their tactile function.[3] What is ORAL STEREOGNOSTIC TESTS-it involves tactile-kinaesthetic identification of an object's form, when placed inside the subject's mouth. It is a neurophysiological testing of the trigeminal system.[3] Instudy done by Muller and colleagues in the year 1995 they assessed oral stereognosis and tactile sensibility tests. From this they could sufficiently measure the patient's oral perception. They found out that oral stereognosis and tactile sensibility are diminished at an elderly age. Good denture retention facilitates the adaptation process and is a prerequisite for tactile sensibility.[4]in our study we found out that oral stereognosis was better with overdenture. Study done by F. A. Catalanotto and J. Moss in the year 1997on patients having surtain abnormalities and defect. They found out those patients with psodohyperthyroidism and chromatin-negative gonadal dysgenesis large defect present with oral steriognosis.[5] Study done by L. Engelen and colleagues in the year 2004 they found out that oral perception of the sizes of small spheres was underestimated, and the sizes of large spheres were

overestimated. Topical anesthesia reduces spatial acuity but does not affect the perception of sphere size.[6] Study done by Reinhilde Jacobs and colleagues in the year 1997 they concluded that osseointegrated implants prostheses demonstrated similar stereognostic ability. However they were one-third to one-quarter less effective than healthy natural dentition. This difference may occure due to lack of periodontal ligament receptors around endosseous implants.[7] in our study when we tested steriognostic ability of complete denture and over denture. It was good with denture than without denture and better with overdentures than complete dentures.

CONCLUSION

The results of this study lead to the following conclusion:

⟩ That covering the palatal mucosa with a denture does not reduce oral stereo gnostic ability.
⟩ The critical evaluation of prosthesis includes dentist's objective skills of treatment and the patient's subjective judgment about oral health, function and esthetics but also the patient's oral perceptive skills.
⟩ Preserving the tooth structure for overdenture treatment always help to improve patient tactile and proprioceptive sensation,
⟩ It also helps to increase patient masticatory ability.
⟩ And also help patient to accept treatment psychologically.

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