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Evaluation Of Time Dependent Oral Stereognostic Ability In Resorbed Edentulous Cases With And Without Complete Denture – A Clinical Study

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Abstract
Aim*: Oral stereognosis specifically refers to the ability to identify the shape and form of an object inside the oral cavity without relying on visual cues. It is a crucial aspect of oral health assessment and plays a significant role in determining how patients respond to various dental treatments and therapies. The ability to perform oral stereognosis is attributed to the involvement of multiple groups of mechanoreceptors located in various oral structures. The effectiveness of oral stereognostic testing is influenced by the design of the experiment, including the method and materials used. The shape identification ability of patients is evaluated with the help of 5 different shapes like triangle, rectangle, square, stare and round. This stereognathic ability has been checked at various appointments and accordingly to that it is divide into 5 groups (n=30) which are; Score card 1: at the time of reporting, Score card 2: at denture delivery, Score card 3: at one month, Score card 4: at three months & Score card 5: at 6 months. Oral stereognosis is closely connected to an individual's overall oral health and is integral to their treatment. The results of the study demonstrate a noteworthy improvement in the participants' ability to identify objects following dental rehabilitation, especially when compared to their edentulous state. Furthermore, it was observed that this ability continued to progress gradually over the course of the study period, allowing participants to successfully identify new objects with increasing proficiency over time.*

Keywords*: Oral Stereognosis, Dental Rehabilitation, Mechanoreceptors, Oral Stomatosensory Function.*

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I. Introduction:

Oral stereognosis, a sensory function reliant on the touch sensations perceived through the tongue and mouth, operates independently of visual and auditory cues[1]. This intricate process is facilitated by mechanoreceptors, which detect tactile stimuli and play a crucial role in the brain's parietal cortex by receiving stimuli from objects, generating sensations, and comparing them to past memories[2,5].

The condition of one's teeth significantly influences their oral stereognosis. Loss of teeth, whether partial or complete, can lead to alterations in oral function. Dentulous patients, those with intact teeth, typically exhibit greater tactile exploration abilities compared to edentulous individuals due to their enhanced exploratory capacity[3,6,9-11].

However, it's important to note that stereognosis encompasses more than merely detecting tactile stimuli. This complex process extends to evaluating an individual's oral function and assessing the outcomes and satisfaction of oral therapy[3,6-8]. To achieve this evaluation, sensory testing methods are employed as indicators of functional sensibility[4].

Consequently, the primary objective of this study is to compare and evaluate changes in oral stereognosis before and after the placement of complete dentures during one-month, three-month, and six-month follow-up periods.

II. Materials And Method:

***Study Population*:** The study included 30 edentulous patients who sought treatment in the Department of Prosthodontics, Crown & Bridge, and Oral Implantology, College of Dental Science and Hospital, Amargadh – 364 210, Gujarat. These subjects were carefully screened to ensure the absence of chronic pain related to the stomatognathic system, oral mucosal lesions, xerostomia, and neuromuscular problems. Following the screening process, a final sample of 30 participants was selected, with an age range of 50 to 70 years and an average duration of edentulism between 8 and 10 years.

***Clinical Data Collection*:** A maxillary and mandibular complete denture were fabricated.

To assess oral stereognosis, a subset of shapes (square, rectangle, round, triangle, and star) was chosen from the 20 shapes designated by the National Institute of Dental Research (**Fig. 1**). These shapes were replicated using Heat Cure PMMA resin, standardized to 4 mm thickness and 10 mm in diameter or length, each equipped with a long thread to prevent accidental aspiration.

Before the assessment, the patients were provided with an explanation of the procedure, allowing them some time to familiarize themselves with the test forms. The patient's view of the specimens was obstructed (**Fig. 2**), and the first specimen was positioned at the mid-dorsal part of the tongue. An arbitrary order for placement was assigned and consistently followed throughout the testing. Patients were instructed not to bite, suck, or push the objects toward their lips.

Following manipulation of each test object (**Fig. 3**), the patients were asked to identify the corresponding shape they felt using their tongue (**Fig. 4)**. Scores ranging from 0 to 5 were assigned to each patient based on their ability to correctly identify the objects. This process was repeated for all the objects.

Oral stereognosis assessments were conducted at multiple time points: at the outset of the treatment, during denture delivery, and subsequently at one month, three months, and six months following denture delivery.

Fig. 1: Triangle, star, rectangle, square and round shape was chosen from the 20 shapes designated by the National Institute of Dental Research.

Fig. 2: Patient's view was obstructed using black cloth.
Fig. 3: spicemens were placed in patient's mouth
Fig. 4: Manipulation of specimen done by the tongue for identification of shape.

III. Results:

Table 1: Data on scores at the time of OPD, delivery of denture, 1 month, 3 months, and 6 months of delivery

Score	n	Mean ± SD
Time of OPD	30	3.57 ± 0.971
Denture delivery	30	3.57 ± 0.971
After 1 month of denture delivery	30	3.97 ± 0.907
After 3 month of denture delivery	30	4.53 ± 0.629
After 6 month of denture delivery	30	4.87 ± 0.507

Table 2: Mean comparison of scores at time of OPD, delivery of denture, 1 month, 3 months and 6 months of delivery

	N	Mean	Std. Deviation	p-Value
Time of OPD	30	3.57	.971	0.01*
Denture delivery	30	3.57	.971	
1 Month Denture Delivery	30	3.93	.907	
3 Months Denture Delivery	30	4.53	.629	
6 Months Denture Delivery	30	4.87	.507	
Level of significance p≤0.05* Test applied Repeated Measures ANOVA				

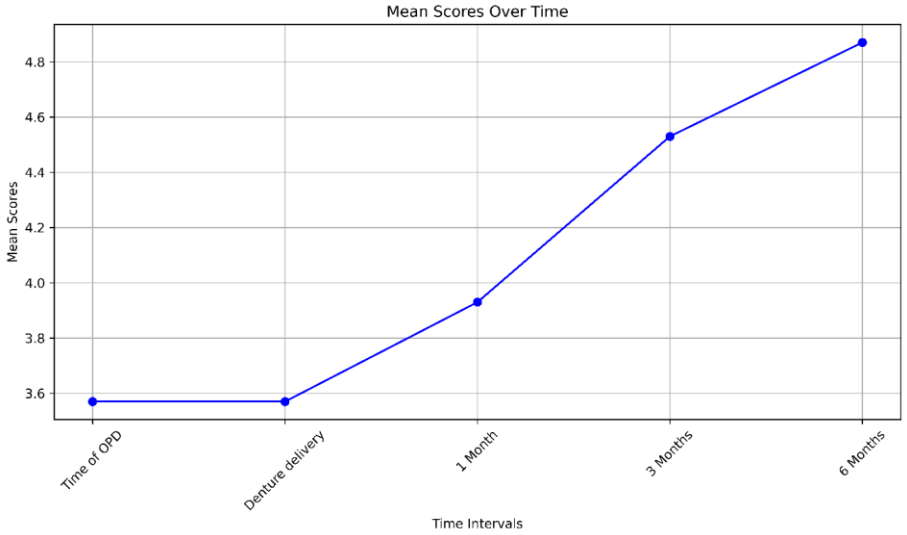
In Table 2, mean comparison of scores at the time of OPD, Delivery of denture, 1 month, 3 months & 6 months of delivery". The table shows that the mean score is highest at 6 months (4.53) and lowest at the time of OPD (3.57). The p-value is 0.01, which means that there is a statistically significant difference between the means.

Table: 3 Post Hoc Comparisons

(I) Time Intervals	(J) Time Intervals	Mean Difference	Std. Error	Sig.
Time of OPD	Denture delivery	.000	.212	1.000
	1 Month Denture Delivery	-.367	.212	.855
	3 Months Denture Delivery	-.967*	.212	.01*
	6 Months Denture Delivery	-1.300*	.212	.01*
Denture delivery	Time of OPD	.000	.212	1.000
	1 Month Denture Delivery	-.367	.212	.855
	3 Months Denture Delivery	-.967*	.212	.01*
	6 Months Denture Delivery	-1.300*	.212	.01*
1 Month Denture Delivery	Time of OPD	.367	.212	.855
	Denture delivery	.367	.212	.855
	3 Months Denture Delivery	-.600	.212	.053
	6 Months Denture Delivery	-.933*	.212	.01*
3 Months Denture Delivery	Time of OPD	.967*	.212	.01*
	Denture delivery	.967*	.212	.01*
	1 Month Denture Delivery	.600	.212	.053
	6 Months Denture Delivery	-.333	.212	1.000
6 Months Denture Delivery	Time of OPD	1.300*	.212	.01*
	Denture delivery	1.300*	.212	.01*
	1 Month Denture Delivery	.933*	.212	.01*
	3 Months Denture Delivery	.333	.212	1.000

Table 3 shows the post hoc comparisons, which are used to compare the means of two groups at a time. The table shows that there is a statistically significant difference between the mean score at 6 months and the mean score at the time of OPD (p=0.01). There is also a statistically significant difference between the mean score at 6 months and the mean score at 1 month (p=0.01).

Chart :1



This chart illustrates the progression of mean scores, showing a general increase from the initial OPD time to 6 months after denture delivery. The significant increase, especially noted at the 1-month mark and continuing upwards through 3 and 6 months, aligns with the statistical analysis indicating improvements over time.

IV. Discussion

This study investigated the impact of complete denture placement on oral stereognosis in edentulous patients. The findings revealed a statistically significant improvement in oral stereognosis scores over a six-month period following denture delivery.

The observed improvement in tactile perception can be attributed to several factors. Firstly, complete dentures restore occlusal function and proprioception, enhancing sensory input from the oral cavity[7]. This increased sensory input likely stimulates the mechanoreceptors in the tongue and surrounding tissues, leading to heightened sensitivity and improved object identification abilities.

Secondly, dentures may provide a more stable platform for the tongue to explore objects during manipulation. Edentulous individuals often exhibit reduced tongue mobility due to the lack of stimulation from teeth[8]. Dentures can potentially counteract this by creating a more defined surface for the tongue to interact with, facilitating more precise and efficient object manipulation.

Furthermore, the psychological aspect of regaining oral function through dentures cannot be disregarded. Edentulism can significantly impact an individual's confidence and quality of life[9]. The ability to chew and speak effectively with dentures may contribute to a renewed sense of confidence and a willingness to explore objects orally with greater focus and attention.

The results of this study align with previous research highlighting the positive influence of dentures on oral somatosensory function[9]. Our findings further emphasize the time course of improvement, with statistically significant changes observed as early as one month after denture delivery and continuing to progress over the following five months.

This study has limitations. The sample size was relatively small, and further research with larger populations is warranted. Additionally, the study design did not incorporate a control group, making it difficult to isolate the specific effects of dentures from other potential factors influencing oral stereognosis over time. Future studies could benefit from including a control group of edentulous individuals who do not receive dentures.

V. Conclusion

The present study confirms that complete denture placement offers a clear benefit to edentulous patients by improving their oral stereognosis. We observed a statistically significant increase in patients' ability to identify objects with their tongue over a six-month follow-up period. This improvement can likely be attributed to restored oral function, enhanced sensory input, and a potential psychological boost associated with regaining the ability to chew and speak effectively.

These findings contribute to the growing body of evidence highlighting the positive impact of dentures on more than just mastication. By improving oral somatosensory function, dentures may play a role in enhancing overall oral health and potentially improving an individual's quality of life.

Future research with larger sample sizes and the inclusion of a control group would further strengthen these conclusions and provide a more comprehensive understanding of the multifaceted benefits of complete dentures for edentulous patients. Additionally, exploring the long-term effects of dentures on oral stereognosis beyond the six-month window could offer valuable insights for clinical practice.

Conflicts of Interest

The authors declare that they have no conflict of interest.

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