

Case Series

Gender Predilection for Qualitative Improvement of Tactile Perceptions and Speaking Proficiency of a Completely Edentulous Population In and Around Kolkata and Sub –Urban Areas Rehabilitated With Complete Dentures

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ABSTRACT

There is a high need and necessity for rehabilitation of completely edentulous subjects with complete dentures. Despite the superfluous use of implant supported prosthesis, conventional complete dentures are still considered the workhorse in rehabilitation due to economic constraints and complex surgeries. The study undertaken was a humble effort to decipher an improvement of speaking abilities and an attempt to correlate the same from a gender perspective, post rehabilitation in a staged and synchronized manner.

Key words: Metallic based dentures, Verbal Proficiency, Intelligibility.

Introduction

Speaking fluently indeed is the elixir of life to maintain social well-being, and it places the responsibility on the part of a prosthodontist to not only rehabilitate what's lost, but at the same time undertake a holistic approach such that an edentulous patient rehabilitated with a complete denture enjoys a hassle free life in terms of communication and maintain more or less the equal amount of tactile

perception in the edentulous state after loss of sensory neuroperception and oral stereognosis. Rugae and incisive papillae are identified as definitive landmarks by the tongue and failure to duplicate them in dentures causes loss of definitive landmarks, leading to further movement of the tongue resulting in a hampered speech outcome¹. Scholser and Ghel² stated that overcoming the articulatory deficiencies occurring due to partial or complete loss

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of natural teeth was one of the major objectives for fabrication of complete denture prosthesis. Despite the importance and need for duplication of contours in order to markedly improve tactile sense thus the verbal proficiency for denture wearers, there lurks a few contradictory reports in the literature regarding the impact of various combined factors on the quality of speech articulation. Following extraction no loss of considerable amount of tissue occurs on the anterior palatal region hence denture bases should be as thin as possible so that the tongue space would be reduced as little as possible.³The accommodation period to new dentures are usually completed by few weeks after denture insertion. During adaptation, a series of changes occur. Researches in the past^{4,5} though have scuttled its way in achieving means to modify the palatal portion of the complete dentures, but often had confronted difficulties in analyzing and interpreting degrees of improvement on a punctilious standpoint from a prosthodontic perspective. The present study aimed to make a comparative evaluation to appraise the improvement between complete dentures and metallic based dentures in completely edentulous subjects of either sex through an economical and less cumbersome method of (subjective analysis) i.e. speech intelligibility within an interval time period of 14 days. This study was based on a null hypothesis that no association existed between improvements of desired parameters as well as inter gender variation.

Materials and Methods

This study was performed on ten completely edentulous patients in the mean age range of 50 – 70 years, of either sex reporting to the outpatient Department of Prosthodontics and Crown & Bridge, Guru Nanak Institute of Dental Sciences & Research, Kolkata after obtaining

prior permission and ethical clearance from institution's ethics committee. Each of the selected subject who fulfilled the inclusion criteria (patients having class 1 ridge relationship and adequate inter arch space) received a conventional complete denture and a metallic based denture, followed by assessment of speaking proficiency through intelligibility rating scale. (A scale developed and duly collected with permission from Ali Yavar Jung National Institute of Speech & Hearing Disabilities, Bonhoogly, and Kolkata). An informed consent from each subject was obtained prior to commencing the study, which explained the necessity of taking questionnaires and clinical examinations for this study purpose to the subjects. After thorough corroboration of history and clinical examination the commencement of conventional complete dentures was done. For the metallic based dentures maxillary definitive/master casts were obtained followed by duplication of the casts in duplicating media (reversible hydrocolloid (agar agar) Castogel, Bego, Germany). The wax pattern was fabricated with desired relief, sprued and subsequently invested and placed in the burn out furnace and casting was performed. Finally the conversion of cast base to record base was done by addition of polymerizing resin and the denture was flaked and processed further in conventional fashion (Figure 1) and post insertion instructions were given to the patients and were asked to report back after one week usage for qualitative assessment through intelligibility scale as depicted in (Box 1). The printed sheet was explained to the patients and the patients were asked to readout a list of words provided at an interval of few seconds to maintain uniform space and later the patient was engaged in a conversation for a short period of time. The scoring was based on a seven point scale and data was recorded.

Results

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS 24.0 and GraphPad Prism version 5. Data had been summarized as mean and standard

deviation for numerical variables and count and percentages for categorical variables.

Table I : Scores of Intelligibility Rating for M1 (conventional denture), and M3 (metallic based denture).



Figure 1: Metallic based denture

Sl No.	Subject	Age/ Sex	Intelligibility Rating	
			M1	M3
1.	Subject A	54/M	1	0
2.	Subject B	63/F	2	1
3.	Subject C	66/F	1	1
4.	Subject D	68/M	2	1
5.	Subject E	60/F	1	1
6.	Subject F	64/M	2	0
7.	Subject G	57/M	2	1
8.	Subject H	57/M	1	1
9.	Subject I	59/F	2	2
10.	Subject J	64/F	2	1

INTELLIGIBILITY RATING SCALE	
Description of speech sample	Point Scale
Normal	0
Can understand without difficulty , however feel speech is not normal	1
Can understand with little effort occasionally need to ask for repetition	2
Can understand with concentration and effort especially be sympathetic listener	3
Can understand with difficulty and concentration by family, but not others	4
Can understand with effort if content is known	5
Cannot understand at all even when content is known	6

Box 1: Speech Intelligibility rating Scale

Speech intelligibility was evaluated in a manner that the patients were asked to readout clearly a set of common words (Bengali words which simulated phonemes such as 'F, V, T, D, B, P, M and S') at regular intervals and later the patient was engaged in a running conversation for a stipulated period of time. Recordings were done with conventional dentures (designated as M1) and subsequently with metallic based dentures (designated as M3) at an interval of 8-10 days after insertion of the respective dentures. The scoring was adjudged by two observers and recorded subsequently.

Table 2 shows the distribution of mean speech intelligibility test of 10 completely edentulous patients at various stages transiting from rehabilitation with conventional dentures (M1), to customized metallic based dentures (M3). Mean values with standard deviation are mentioned. On evaluating the intelligibility scores, it was seen that the mean value of the scores gradually decreased from the state of conventional dentures to subjects rehabilitated with customized dentures. Difference between distribution of mean speech intelligibility test with conventional dentures (1.5000 ± 0.5270); and customized metallic base dentures (0.8000 ± 0.4216) was found to be statistically highly significant ($p < 0.0001$). The metallic based dentures had a range within (0.0000-1.0000) and a median value of (1.0000) suggesting strikingly significant improvement scores in intelligibility.

Discussion

The insertion of complete dentures often leads to speech alteration. Although many of the alterations are temporary in nature, they often create a sense of worry for patients. From a broad prosthodontic viewpoint, there is a definite lacunae of guidelines for designing dentures with the best phonetic success.

The study includes completely edentulous subjects of either sex, as differences in palatal morphology often create a differential response to changes in the oral cavity geometry created by maxillary prostheses.⁶ A plausible explanation that the mean fundamental frequency, which is associated with the perceptual notion of pitch, is commonly considered as the major difference between adult male and female voices. Cross-gender variations can mainly be accounted for by anatomical and physiological differences that arise during puberty. Vocal folds become longer and thicker in male speakers that explains why they tend to vibrate more slowly than those of women. A second important anatomical issue is the vocal tract length, that is, the distance from the vocal folds to the lips: all things being equal, the longer the vocal tract, the lower the resonant frequencies. The average length of the adult female vocal tract is about 14.5 cm, while that of a male individual is about 17 to 18 cm long.⁷ These would account, at least in part, for cross-gender differences observed in intelligibility ratings which are evident in

Table 2: Distribution of mean INTELLIGIBILITY TEST among two groups

		Number	Mean + SD	Minimum	Maximum	Median	p-value
INTELLIGIBILITY RATING	M1	10	1.5000 + 0.5270	1.0000	2.0000	1.5000	<0.0001
	M3	10	0.8000 + 0.4216	0.0000	1.0000	1.0000	

the present study in terms of quantification in improvement of parameters in male more than in female subjects.⁸ One study has substantiated the finding by advocating that when investigating the impact of prosthesis on speech it is wise to consider the role of both palatal morphology and gender as men and women have different speech sound amplification, because of their different oral cavity volume which further justifies the gender predilection after adaptation period when subjected to qualitative analysis in the present study.⁹

A conventional complete denture was fabricated for the subjects, which was worn for a period of two weeks, following which the individual was subjected to intelligibility rating analysis. This period is very essential and apt before performing various speech tests and is in accordance with the study performed elsewhere,^{10,11} who advocated similar findings that the process of adaptation of the prosthesis seems to be acquired through a “feedback mechanism (orosensorial reflex) concerned with speech motor programming”. This very fact can explain one aspect of improvement in subjects, in the present study at the stage of customization (metallic based denture) because the same subject when analyzed had already been subjected to a period of adaption for more than two weeks.

A possible factor that might have influenced the intelligibility rating scores at different stages is the speaking rate while reading out the list of words or while engaging in a conversation but conclusive correlation was not found. Another study¹² supported the evidence of this present study by advocating that there “might be some evidence that overall speaking rate varies with paralinguistic characteristics such as speaker’s gender and dialect.” Better tactile perceptions was also deciphered with the subjects when rehabilitated with metallic base dentures as subjects could locate better

anatomical cues while speaking, as utility of using metals and metal alloys in denture bases displays excellent strength to volume ratio for which it can be casted in thin sheets maintaining rigidity and fracture resistance justifies the abovementioned finding.

Conclusion & Limitations

Apart from retention, stability and support of the prosthesis an equal amount of emphasis has to be laid down on phonetical aspects to improve the overall psychological well-being and social upliftment for patients and in edentulous individuals whose profession demands a fluency and clarity in speech, for instance a public speaker. Limitations included subjective evaluations which could have varied among different observers, and for a more conclusive understanding, further studies with a similar structural design needs to be done to unravel this finding.

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