

COMPARISON OF PATIENT'S SATISFACTION LEVEL WITH COMPLETE DENTURES FABRICATED BY NEUTRAL ZONE TECHNIQUE AND CONVENTIONAL TECHNIQUE

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ABSTRACT

The objective of the study was to compare the satisfaction level of edentulous patients provided with complete dentures that were fabricated by either the neutral zone technique or the conventional technique. For this a quasi experimental comparative study (Phase 2 trial) was carried out at Department of Prosthodontics, Armed Forces Institute of Dentistry, Rawalpindi, Pakistan from September 2006 to February 2008. Sixty edentulous patients were included in the study and randomly placed into two groups. Complete dentures were fabricated for these patients; by the neutral zone technique for Group A and by the conventional technique for Group B. The satisfaction level of patients was assessed after six months of denture insertion with the help of a questionnaire. In Group A, 8 were highly satisfied, 19 fairly satisfied and 3 poorly satisfied while in Group B, 3 were highly satisfied, 16 fairly satisfied and 11 poorly satisfied. Chi-square test revealed a significance of 0.03 ($P < 0.05$) regarding comparison of patient's satisfaction level in both the study groups. It was concluded that dentures fabricated by neutral zone technique were more stable and functionally better than conventional dentures.

Key Words: Neutral zone, Ridge resorption, Denture surfaces.

INTRODUCTION

Techniques of complete denture fabrication, although not standardized, have met with high levels of success on part of the patient.¹ Physiologically, complete dentures are meant to function inside the oral cavity under direct muscular influences offered by tongue, cheeks and lips.² In order to maintain the dentures in harmony with the surrounding musculature, different concepts related to positioning of the artificial teeth and shaping of the polished surfaces have been proposed.^{3,4}

Conventionally, teeth are arranged over the center of the residual ridges to obtain the best possible mechanical advantage by transmitting forces of mastication along the long axis of the residual bone. In the neutral zone concept, teeth are arranged in an area where outward forces of the tongue and inward forces of the lips and cheeks are balanced.⁵ Teeth come to lie in a position of muscle balance which is usually not advantageous from the mechanical point of view but dentures so fabricated remain stable and retentive due to action of the surrounding musculature. Furthermore, polished surfaces are developed with favorable slopes to counter the horizontal forces acting on the dentures especially in cases of highly resorbed residual ridges.^{6,7}

Both the conventional and the neutral zone concepts are considered equally effective in denture fabrication.⁸ However, it still remains a debatable issue as to which technique is superior in terms of patient satisfaction. Only a few international studies have

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reported on the assessment of satisfaction level of patients provided with complete dentures fabricated by both techniques. No local data were cited in this regard in a thorough search of various dental journals and internet databases of the country. Therefore, the aim of the present study was to compare the satisfaction level of patients provided with complete dentures made by the conventional technique and the neutral zone technique. This information can be utilized in rendering better care to the edentulous patients in this part of the world.

METHODOLOGY

This prospective quasi experimental comparative study (Phase 2 trial) was conducted in the Department of Prosthodontics at Armed Forces Institute of Dentistry, Rawalpindi from June 2007 to February 2008. Sixty edentulous subjects fulfilling the inclusion criteria (male and female patients ranging in age from 51 years upto 70 years who had square-shaped mandibular residual ridges and U-shaped palate) were enrolled in the study with non-probability purposive sampling technique after taking informed consent. Subjects with temporomandibular disorders, intra or extra-oral clinical lesions, flabby residual ridges, xerostomia, oral carcinoma, history of irradiation and diabetes mellitus were excluded.

All patients were given a specific number from 1 upto 60 in the order they reported for treatment. All odd numbered patients (1, 3, 5, etc.) constituted Group A and were provided with neutral zone (NZ) complete dentures. All even numbered patients (2, 4, 6, etc.) made up the Group B and were provided with conventional complete dentures.

There was no risk to the patients of either group by providing dentures with any of the two techniques. Complete medical and dental history was recorded, followed by clinical examination. Any relevant investigations were ordered along with an OPG for assessment of bone levels.

All patients were provided with complete dentures made by following the usual clinical steps and laboratory procedures. These included recording of initial impressions in high viscosity alginate impression material (CA37 manufactured by Cavex Inc., Holland); fabrication of close-fitting custom impression trays in self-cured acrylic resin (Self Polymerizing Powder, manufactured by Deven International, United Kingdom); border molding with stick compound

(Kemdent Tracing Sticks, manufactured by Associated Dental Products Ltd, UK); recording the final impressions in zinc oxide impression paste (Cavex Outline Impression Paste, manufactured by Cavex Holland BV, the Netherlands); formation of the master casts by the boxing method; fabrication of final denture bases in heat-cured acrylic resin (Stellon C manufactured by B.D. Inc., England); fabrication of wax occlusal rims to record jaw relationships i.e. orientation relation by the use of Hanau fascia type face-bow, occlusal vertical dimension by the facial height measurement method and centric relation by gothic arch tracing method; mounting of maxillary and mandibular denture bases on Hanau Model H semi-adjustable articulator by using the jaw relation records; tooth setup in balanced occlusion; trial of waxed up dentures and final processing before delivery of the finished dentures to the patients.

For Group A patients only, after mounting the bases on the articulator, the neutral zone was also recorded by following a standard technique, as outlined by Chandra.⁹ After making the wax occlusal rims within the recorded neutral zone, tooth setup was completed by following the neutral zone. For Group B patients, after mounting the bases on the articulator, tooth setup was completed by using anatomical landmarks as a guide.¹⁰

After insertion, for both groups, necessary occlusal adjustments were done. Instructions were cited and follow-up visits scheduled after 24 hours, 72 hours and after 2 weeks for the adjustment of post-insertion complaints. When the patients were free of post-insertion complaints, then patient satisfaction level was assessed after 6 months of denture insertion with the help of a proforma.

Patient's satisfaction level was assessed by asking four major questions regarding comfort, dislodgement of dentures (stability), ability to chew (mastication) and speech. Each question was assessed by three categories i.e. good, fair and poor. Good was given 3 marks, fair 2 marks and poor 1 mark. Maximum marks that could be attained were 12 and minimum 4. Patient's satisfaction level was graded as "highly satisfied" (score of 10 to 12), "fairly satisfied" (score of 7 to 9) and "poorly satisfied" (score of 4 to 6).

Data were analyzed by using the software SPSS version 10. Mean and standard deviations were calculated for age and satisfaction scores. Frequencies as percentages were used for satisfaction level i.e. com-

fort level, stability, mastication, and speech. Chi-square test was applied to compare the patient's satisfaction level in both the study groups. The level of significance was taken as $P < 0.05$ at 95% confidence interval.

RESULTS

A total of 60 patients were included in the study. The mean age of participants was 57.67 years and standard deviation was 5.587. In Group A, the mean age was 56.50 years and in Group B it was 58.83 years. Standard deviation remained at 5.138 in Group A and 5.855 in Group B. Patients were arranged into two subgroups on the basis of their age: between 51-60 years, there were 41 patients; between 61-70 years, there were 19 patients only.

The study sample included a total of 33 (55.0%) males and 27 (45.0%) females, with a male to female ratio of 1.2:1. In Group A, there were 17 (56.7%) males and 13 (43.3%) females while in Group B there were 16 (53.3%) males and 14 (46.7%) females.

Detailed view of the study results according to stability, generalized comfort, chewing efficiency and ability to speak properly is presented in Table 1.

Overall, out of the sixty patients included in the study, 11 (18.3%) patients were highly satisfied with their complete dentures while 35 (58.3%) were fairly

satisfied and 14 (23.3%) were poorly satisfied. A detailed view of these results is presented in Table 2.

Chi-square test applied at 95% confidence interval revealed a highly significant outcome (P value 0.03) when the satisfaction level of patients was compared among the study groups.

DISCUSSION

This study demonstrates higher patient's satisfaction level with complete dentures fabricated by neutral zone technique as compared to conventional technique. No such study was conducted in Pakistan to assess the satisfaction level of patients by comparing both the techniques. Patients who had been provided with dentures fabricated with neutral zone technique were more comfortable, able to speak properly with ease and their denture stability was better than patients provided with complete dentures fabricated by the conventional technique.

The overall results of this study were in accordance with the study of Fahmy and Kharat.⁶ They concluded that the dentures fabricated with neutral zone technique were more comfortable and functionally stable than dentures fabricated by conventional technique. Barrenas and Odman⁸ also advocated that dentures fabricated by the myodynamic theory (neu-

TABLE 1: DETAILED VIEW OF STUDY RESULTS

	Highly Satisfied		Fairly Satisfied		Poorly Satisfied	
	Group A	Group B	Group A	Group B	Group A	Group B
Stability	2(6.7%)	Zero	23(76.7%)	22(73.3%)	5(16.6%)	8(26.7%)
General Comfort	11(36.7%)	2(6.7%)	17(56.6%)	20(66.6%)	2(6.7%)	8(26.7%)
Chewing Efficiency	3(10.0%)	12(40.0%)	15(50.0%)	7(23.3%)	12(40.0%)	11(36.6%)
Speech	17(56.6%)	4(13.3%)	13(43.3%)	20(66.6%)	Zero	6(20.0%)

TABLE 2: COMPARISON OF PATIENT'S SATISFACTION LEVEL (N=60)

Patient's Satisfaction Level	Study Groups				Total	
	Group A	%age	Group B	%age	Total	%age
Poorly satisfied	3	10.0	11	36.6	14	23.3%
Fairly satisfied	19	63.3	16	53.3	35	58.3%
Highly satisfied	8	26.6	3	10.0	11	18.3%

tral zone) resulted in better clinical outcome regarding functionality of complete dentures due to proper contouring of the denture flanges and positioning of the artificial teeth.

In the present study, the comfort level was assessed to be good in 11 subjects of Group A and only 2 subjects of Group B. This was a marked difference between both groups, which was somewhat expected at the start of the study because earlier research^{6,8} has also demonstrated more comfortable dentures with the neutral zone technique.

Beresin and Schiesser¹¹ had emphasized that the position of the teeth and contours of the polished surfaces have great impact on the stability of complete dentures and teeth should be placed in a space known as neutral zone to enhance stability. Pound³ stated that teeth should not be arranged on the crest of the ridge in every case because it hampers the functional activities due to instability of the lower denture. Miller et al¹² and Zaigham⁵ advocated that dentures fabricated with neutral zone technique were more stable than conventional dentures. Current study revealed that although more stable dentures were fabricated with neutral zone technique, however no major difference was observed in this regard among both groups. For instance, stability was graded as good by only 2 patients of Group A and none for Group B. This may have been due to the inclusion criteria in which patients having square-shaped residual ridges were included in both the groups. Square-shaped ridges tend to provide a good basis for retention and stability. Despite this reason, dentures were better stabilized with neutral zone technique due to positioning of the teeth in an area where surrounding muscular forces are in balance and lingual flanges are contoured in such a way that they provide adequate space for normal actions of the tongue. The tongue therefore plays a very important role in the stability of lower denture.

The current study revealed that regarding assessment of the ability to chew, only 3 patients in Group A were in criteria "good" as compared to 12 patients of Group B. Masticatory ability was thus better with conventional technique of denture fabrication which was also reported by Fahmy and Kharat.⁶ When teeth were arranged over the crest of the ridge, it favored the

mechanical principles related to mastication by directing the occlusal loads along the long axis of the bone. Weinberg¹³ stated that buccal cusps and fossae of posterior teeth should be directly over the crest of the ridge. Heartwell and Rahn¹⁴ advocated that posterior teeth should be positioned buccolingually on the crest of the residual ridge. In the neutral zone concept, although it is agreed that leverage is unfavorable, but it is overcome by the fact that the dislodging muscle forces are activated to retain and stabilize the lower complete denture.^{12,15}

Speech considerations are of paramount importance while fabricating complete dentures. During speech, tongue plays a key role. Rilandi and Sharry¹⁶ pointed out that the size of the tongue does not decrease like generalized atrophy of all other tissues in aged people. There is about 10% increase in the size of tongue in edentulous patients if they are not provided with complete dentures. Zaigham⁵ also advocated that neutral zone technique provided sufficient room for tongue. Goyal and Greenstein¹⁷ functionally molded the palatal contours of the maxillary dentures and compared speech performance with conventional dentures. Their study showed that speech was markedly improved with functionally contoured dentures. In neutral zone approach, the position and movements of tongue is given due importance and position of tongue is recorded through various functional movements. In the present study, 17 patients of Group A graded their clarity of speech as good in comparison to only 4 patients of Group B. These results are supported by other studies on the subject.^{5,6,17}

There has been a concern about the exact position or location of the neutral zone in the edentulous mouth. A recent study has shown that with prolonged period of edentulousness, there was a lingual shift in the position of the neutral zone in relation to the crest of the residual ridge. In such patients, it is better to go for the conventional technique to position the artificial teeth on the crest of the residual ridge without encroaching upon the functional space of the tongue.¹⁸

In order to fabricate a denture with the neutral zone technique, the doctor not only needs to adjust extra material costs and more chair-side time in the

clinic but he requires access to a well-trained laboratory technician as well. In the present study, material cost was managed by using impression compound which was readily available in the department while chair-side time was managed by having a well-trained senior resident perform all the clinical steps for neutral zone recording, which in the case of impression compound becomes a very lengthy, hectic and laborious job. It was also fortunate that highly trained laboratory technicians were available at the Central Prosthodontic Laboratory attached with the department, where a single senior technician performed all the processing steps.

Now-a-days, better choice of materials is available for recording the neutral zone such as silicones, tissue conditioners/resilient lining materials¹⁹ and even the visible light-cured relines resins.²⁰ Although these materials are expensive, yet in skilled hands, they can be easily manipulated and used, thereby saving the clinical time of the doctor and the patient.

The results of this study may have important clinical implications, since there has been a lack of clear information about recording the neutral zone while fabricating dentures and defect prosthesis. Benefits of this concept in the provision of partial dentures and defect prostheses require further attention from future researchers.

CONCLUSION

Within the limitations of this study, the following conclusions can be drawn that the satisfaction level of patients provided with complete dentures fabricated by the neutral zone technique is generally greater as compared to those dentures made by the conventional technique and the neutral zone technique resulted in more stable and functionally better complete dentures.

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