PROSTHODONTICS

OPEN ACCESS

ORIGINAL ARTICLE

COMPARISON OF TWO NEUTRAL ZONE TECHNIQUES TO EVALUATE PATIENT'S SATISFACTION

[1]SUMAYIA QAISER, [2]SYEDA SAMEEN ZEHRA RIZVI, [3]MAIMOONA SIDDIQ, [4]KIRAN TARIQ, [5]WASEEM ULLAH KHAN, [6]AMIR RAFIQUE

ABSTRACT

Aim of the study was to compare the frequency of patient's satisfaction using the swallowing neutral zone and phonetic neutral zone recording techniques. It was a prospective randomized experimental study. It was done in the Department of Prosthodontics, de, Montmorency College of Dentistry / Punjab Dental Hospital, Lahore over a period of 9 months from May 4, 2020, to January 30, 2021.

The sample size consisted of 100 cases. It was calculated using the EPI calculator with 95% confidence level, d=0.01with mean 7.04, and standard deviation 0.87.

One hundred subjects were selected and divided randomly into two groups. Patients in group 1 were given dentures made of phonetic neutral zone technique and in group 2 dentures were provided with swallowing neutral zone technique. The patient's satisfaction level was assessed by asking 5 major questions regarding comfort in wearing of the dentures, dislodgement of dentures (stability), ability to chew (mastication), speech and comfort of the tongue at 15 days recall, and the questionnaire was marked in 'yes' and 'no' in a Proforma. Answer in yes was given a score of 1 and answer in "no" was given a score of 0. A score of 3 out of 5 was marked as satisfied and less than score 3 was marked as least satisfied

Patients with the swallowing neutral zone technique in group 2 were more satisfied and comfortable with their dentures. The results of this study can be used to increase patient acceptance and comfort with complete dentures. This can also be used as a guideline for the arrangement of teeth.

Key words: *Neutral zone, Swallowing technique, Phonetic technique, Patient satisfaction.*

This article may be cited as: Qaiser S., Rizvi SSZ., Siddiq M, Tariq K, Khan W, Rafique A. Comparison of two neutral zone techniques to evaluate patient's satisfaction. Pak Oral Dent J 2021; 41(4):256-260.

INTRODUCTION

With the increase in residual ridge resorption, denture supporting area decreases, which decreases the stability and retention of the mandibular complete denture.[1-15] Stability of dentures also decreases because of tongue enlargement and pulling of cheeks inwards by buccinator.[6,7] Thus, positioning of teeth and denture's polished surface becomes extremely important, especially in mandibular complete dentures.[3-8,15.]

The neutral zone concept was introduced by Wilfred fish in 1935.[5] It is bounded by the tongue medially and the lips and cheeks laterally. In this space there exist a harmony between muscular forces which helps in stabilizing the denture. [5,6]

Two methods have been used to record the neutral zone.[2] First method used phonetics and tissue conditioner to shape the neutral zone and the patient is asked to pronounce a phoneme "SIS" 5 times followed by "SO" once.[2] The second method is the swallowing method using modeling plastic impression compound. The patient is asked to swallow warm water multiple times and purse the lips.[2,6]

[1] **Corresponding Author:** Dr Sumayia Qaiser (BDS, FCPS), Demonstrator (Prosthodontics), de,Montmorency College of Dentistry, Lahore Email: dr_sonia_89@hotmail.com, 03361492868

[2] Dr Syeda Sameen Zehra Rizvi (BDS, FCPS), Senior Registrar (Prosthodontics), HITEC Institute of Medical Sciences-Taxilla Cantt Email: syedasamn@gmail.com

[3] Dr Maimoona Siddiq (BDS, FCPS), Assistant Professor (Oral & Maxillofacial Surgery), HITEC Institute of Medical Sciences-Taxilla Cantt Email: monasiddiq1985@gmail.com

[4] Dr Kiran Tariq (BDS), Resident of FCPS prosthodontics, de,Montmorency College of Dentistry, Lahore Email: kirantariq1234@gmail.com.

[5] Dr Waseem ullah Khan (BDS, FCPS), Assistant Professor (prosthodontics), de,Montmorency College of Dentistry, Lahore, Email: veritarian@gmail.com

[6] Dr Aamir Rafique (BDS, FCPS), Assistant Professor (Prosthodontics), HITEC Institute of Medical Sciences-Taxilla Cantt Email: rafiqaamir09@gmail.com

Received for Publication: Jun 6, 2021
First Revision: Jul 8, 2021
Second Revision: Jul 20, 2021
Approved: Aug 4, 2021

A study by Makzoume et al. concluded that the neutral zone that is determined by the phonetic method appears to be narrower posteriorly compared to the swallowing neutral zone method, thus limiting posterior teeth positioning[2]. Location of molar and premolars lingually can alter the tongue space, hence affect the stability of the mandibular denture, resulting in uncomfortable dentures .[3,4]

The aim of our study is to test the hypothesis that the swallowing neutral zone technique provides a more comfortable and stable prosthesis as compared to the phonetic neutral zone technique and also evaluate patient satisfaction with complete dentures constructed with swallowing neutral zone technique and phonetic neutral zone technique, which will eventually help in constructing more comfortable and stable dentures.

METHODOLOGY

This single blinded prospective experimental randomized study was conducted in Punjab dental hospital Lahore between 04-05-2020 to 30-1-2021 for a duration of nine months, after approval from ethical review board with letter number: 2065/DCD. Total number of 100 patients were randomly selected from OPD using non probability consecutive sampling technique with allocation rate 1:1. Subjects included in the study were completely edentulous patients of both genders with ages 50-65 years, requiring new complete dentures, patients with advanced mandibular ridge resorption (Atwood's class V and VI)[5] and patients that are able to understand and respond to the questionnaire used in the study. Patients with mucosal lesions (i.e., ulcerations, erythema, inflammation), uncontrolled systemic diseases (e.g. diabetes, hypertension), acute/chronic symptoms of temporomandibular disorders, psychological conditions that could influence the patient's reaction to the treatment, uneven residual ridges requiring alveoloplasty were excluded from the study.

Informed consent was taken from all the patients. Group 1 patients had denture made up of phonetic neutral zone technique using tissue conditioner as impression material. Group 2 patients had dentures made up of swallowing neutral zone technique using modelling compound as impression material. Tissue conditioner being less viscous material as compare to impression compound is easier to mold while speaking as the impression compound might create difficulty during speech and tongue movements.[17,19] Also studies confirm that using two different materials does not show any significant difference in location of neutral zone due to material consistency.[17,18] Patients fulfilled the inclusion criteria and underwent thorough history and clinical examination. Sociodemographic data was noted. Confounding variables such as patients who were satisfied with previous dentures, patient with mucosal lesions, patients unwilling for the treatment and patients who had multiple dentures made earlier and were not satisfied by any dentures were controlled through exclusion criteria. Complete dentures were constructed according to the standard clinical and laboratory procedures.[1] Patient's satisfaction level was assessed by asking 5 major questions regarding comfort in wearing of the dentures, dislodgement of dentures (stability), ability to chew (mastication), speech and comfort of the tongue. This questionnaire was also used by K. Ladha et al. for assessing patient satisfaction using two different neutral zone techniques.[3] Patients were recalled after 15 days for evaluation and proforma completion. The questionnaire was marked as yes and no. Answer given in yes was given a score of 1 and answer in "no" was given a score of 0. The score of 3 out of 5 was marked as satisfied and less than score 3 was marked as dissatisfied. All the questions were marked by researcher.

All the data collected was entered in Statistical Package for Social Sciences (SPSS) version 21.0 and results were analyzed.[16] The quantitative variables like age and duration of denture wearing were presented as mean with Standard Deviation (S.D). The qualitative variable in data is gender and were presented as frequency and percentages. Data was stratified for age, educational status and gender to address the effect modifiers. Post stratification chi square test was applied to check the significance with p-value < 0.05

RESULTS

For details see table 1-10

DISCUSSION

Removable complete dentures made by the neutral zone techniques tend to be more adaptable by the patient.[6-15,20] In the present study, patient rated their satisfaction of complete dentures made by two neutral zone techniques i.e. swallowing neutral zone and phonetic neutral zone by responding to a questionnaire.[3] The results showed that patients wearing dentures made with swallowing neutral zone technique were more satisfied with their prosthesis and both genders reacted similarly towards their complete denture.

This study has concluded that 44% of the patients were satisfied made with the phonetic neutral zone technique. Among patients wearing dentures made with swallowing neutral zone 74% exhibited satisfaction while 26% were not satisfied. Results of this study were

TABLE 1: GENDER DISTRIBUTION IN STUDY

Gender	Frequency	Percentage
Males	54	54.0
Females	46	46.0
Total	100	100.0

TABLE 2: DESCRIPTIVE STATISTICS OF PATIENT SATISFACTION FOR SWALLOWING AND PHONETIC TECHNIQUE

Technique Used		Frequency	Percent	P- Value
Phonetic	Yes	22	44.0	0.00
	No	28	56.0	
	Total	50	100.0	
Swallowing	Yes	37	74.0	
	No	13	26.0	
	Total	50	100.0	

TABLE 3: PATIENT SATISFACTION WITH COMFORT OF THE DENTURES

Technique Used		Frequency	Percentage	P- value
Phonetic	yes (score 1)	21	42.0	.00
	no (score 0)	29	58.0	
	Total	50	100.0	
Swallowing	yes (score 1)	38	76.0	
	no (score 0)	12	24.0	
	Total	50	100.0	

TABLE 4: PATIENT SATISFACTION WITH THE CHEWING OF THEIR DENTURES

Technique used		Frequency	Percentage	P- value
Phonetic	yes (score 1)	21	42.0	.00
	no (score 0)	29	58.0	
	Total	50	100.0	
Swallowing	yes (score 1)	38	76.0	
	no (score 0)	12	24.0	
	Total	50	100.0	

TABLE 5: PATIENT SATISFACTION WITH STABILITY OF DENTURES

Technique used		Frequency	Percentage	P- value
Phonetic	yes (score 1)		46.0	.07
	no (score 0)	27	54.0	
	Total	50	100.0	
Swallowing	yes (score 1)	32	64.0	
	no (score 0)	18	36.0	
	Total	50	100.0	

TABLE 6: PATIENT SATISFACTION WITH SPEAKING

Technique		Frequency	p-value
Phonetic	Yes (score 1)	25	.10
	No (score 0)	25	
Swallowing	Yes (score 1)	33	
	No (score0)	17	
	Total	100	

TABLE 7: PATIENT SATISFACTION ACCORDING TO AGE

		Patient Satisfaction		Total	p-value
		Yes	No		
Age	50-55	12	9	21	.93
	56-60	31	20	51	
	61-65	16	12	28	
Total		59	41	100	

TABLE 8: PATIENT SATISFACTION ASSOCIATION WITH EDUCATIONAL STATUS

Educational status		Patient Satisfaction		Total	p-value
		Yes	No		
	Illiterate	2	0	0	.40
	Primary	3	1	3	
	Middle	6	2	10	
	Matric and above	4	2	17	
Total		15	11		

TABLE 9: PATIENT SATISFACTION ASSOCIATION WITH GENDER

		Patient Satisfaction		Total	p- value
		Yes	No		
Gender	Male	8	2	10	.72
	Female	12	4	16	
Total		20	6	26	

TABLE 10: DESCRIPTIVE STATISTICS FOR TOTAL SCORE GIVEN BY THE PATIENTS IN REFERRING TO SATISFACTION FOR BOTH TECHNIQUES

	N	**50**
Phonetic	Mean	2.4600
	Median	2.0000
	Std. Deviation	1.24884
	Minimum	1.00
	Maximum	5.00
Swallowing	N	50
	Mean	3.4800
	Median	3.5000
	Std. Deviation	1.26556
	Minimum	1.00
	Maximum	5.00

comparable with a similar study done by K. Ladha et al. in 2013.[3] He evaluated patient satisfaction using the swallowing and phonetic neutral zone. He selected 10 patients and gave 5 patients prosthesis made of swallowing neutral zone while other 5 received prosthesis made of phonetic neutral zone technique. 65% of patients in his study were satisfied with the swallowing neutral zone technique and 30% of patients were satisfied with the phonetic neutral zone technique. Ladha et al. study had a limited sample size of 10 patients, and it was a cross-over study that might alter the patient response to a denture.[3]

Results of the present study were also supported by another two studies by N. Rana et al. and Arslanov et al.[24,25] In both studies position of two neutral zones recording methods were compared and significant differences were found between the location of posterior teeth.[24,25] The neutral zone was found to be more lingually located in the phonetic neutral zone method owing to the contraction of the buccinator muscle, causing instability of the denture.[24,25] Therefore more patient satisfaction with the swallowing neutral zone technique was observed. Bino Verma et al also reported the same results and supported our study.[23]

A study done by Wafaa et al. reported better phonetics with dentures made by swallowing neutral zone technique.[7] This study also reinforces the results of current study in which 33% of patients reported better phonetics with a prosthesis made by swallowing the neutral zone method.

As 64 % of patients were satisfied with the stability of their dentures in swallowing neutral zone technique

similar results can be seen in the study done by B. Verma et al.[21,23]

The strength of this study is that it is supported by other studies done on different populations around the globe, but the sample size of 100 patients and single centered study are the limitations of this study. Larger sample size and records from different centers would obviously yield more reliable data.

CONCLUSION

When comparing patient's satisfaction regarding their dentures made with two techniques of the neutral zone, i.e., the swallowing neutral zone technique, and the phonetic neutral zone technique, the results of this study concluded that patients exhibited more satisfaction with the swallowing neutral zone technique as it does not limit the posterior tongue space. This study can be helpful in tooth positioning and selection of the neutral zone technique for denture fabrication.

Acknowledgement

We are thankful to Yasir Qaiser (Masters in physiotherapy and rehabilitation, KU LEUVEN, Belgium) for providing statistical analysis.

REFERENCES

1 https://www.bsspd.org/About/BSSPD+guidelines.aspx.

2 Makzoumé JE. Morphologic comparison of two neutral zone impression techniques: A pilot study. The Journal of prosthetic dentistry. 2004 Dec 1;92(6):563-68.

3 Ladha K, Gupta R, Gill S, Verma M. Patient satisfaction with complete dentures fabricated using two neutral zone techniques: a within-subject cross-over pilot study. The Journal of Indian Prosthodontic Society. 2014 Jun 1;14(2):161-68.

4 Neill DJ, Glaysher JK. Identifying the denture space. Journal of oral rehabilitation. 1982 May;9(3):259-77.

5 Fish EW. Principles of full denture prosthesis. London: John Bale, Sons & Danielsson, Ltd; 1933. p. 1-8.

6 Porwal A, Satpathy A, Jain P, Ponnanna AA. Association of neutral zone position with age, gender, and period of edentulism. Journal of Prosthodontics. 2018 Mar;27(3):232-39.

7 Swelem AA, Shohdi SS, Mawsouf NM. Setting up of teeth in the neutral zone and its effect on speech. The Saudi dental journal. 2012 Jan 1;24(1):43-48.

8 Saravanakumar P, Thangarajan ST, Mani U. Improvised Neutral Zone Technique in a Completely Edentulous Patient with an Atrophic Mandibular Ridge and Neuromuscular Incoordination: A Clinical Tip. Cureus. 2017 Apr;9(4).

9 Reddy S, Harini T. Influence of tongue in complete denture retention and stability. Annals and essences of dentistry. 2011 Jun;3(3):85.

10 Gahan MJ, Walmsley AD. The neutral zone impression revisited. British dental journal. 2005 Mar;198(5):269-72.

11 Ohkubo C, Hanatani S, Hosoi T, Mizuno Y. Neutral zone approach for denture fabrication for a partial glossectomy patient: a clinical report. The Journal of prosthetic dentistry. 2000 Oct 1;84(4):390-93.

12 Watt DM, MacGregor AR. Designing complete dentures. WB Saunders Company; 1976.

13 Cagna DR, Massad JJ, Schiesser FJ. The neutral zone revisited: from historical concepts to modern application. The Journal of prosthetic dentistry. 2009 Jun 1;101(6):405-12.

14 Ikebe K, Okuno I, Nokubi T. Effect of adding impression material to mandibular denture space in Piezography. Journal of oral rehabilitation. 2006 Jun;33(6):409-15.

15 Raja HZ, Saleem MN. Neutral zone dentures versus conventional dentures in diverse edentulous periods. Biomedica. 2009 Jul;25:136-45.

16 IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp

17 Chaturvedi S, Abdelmonem AM, Haralur S, Suleman G, Majeed MI, Alfarsi MA. An In Vivo Study to Compare Location of Neutral Zone Recorded with Two Materials. The journal of contemporary dental practice. 2019 Feb 1;20(2):239-46.

18 Rana NS. A Clinical Comparative Study of Two Different Materials Used in Recording Neutral Zone in Completely Edentulous Patients at Jaipur Dental College, Jaipur. Journal of Evolution of Medical and Dental Sciences. 2020 Feb 24;9(8):473-79.

19 Wafa'a R, Swelem AA, Abdelnabi MH, Mofadhal A. Effect on patient satisfaction of mandibular denture tooth arrangement in the neutral zone. The Journal of prosthetic dentistry. 2019 Mar 1;121(3):440-46.

20 Pradeep C, Jain S, Lahori M. FABRICATION OF COMPLETE DENTURE USING NEUTRAL ZONE TECHNIQUE IN A PATIENT WITH SEVERELY RESORBED ALVEOLAR RIDGE. Guident. 2021 Feb 1;14(3).

21 Beenu V, Kattak AK, Pattath VS, Nair SJ, Das R, Sreelekshmi MS. Is neutral zone, patients comfort zone? A feedback review. Journal of Pharmacy & Bioallied Sciences. 2020 Aug;12(Suppl 1):S2.

22 Aal A, Hakim MA. The effect of setting-up of artificial teeth in the neutral zone on EMG and Occlusal force equilibration in mandibular two implant overdentures. Egyptian Dental Journal. 2019 Oct 1;65(4-October (Fixed Prosthodontics, Dental Materials, Conservative Dentistry & Endodontics)):3817-27.

23 Binoo Verma1, S V Singh2, Ritu Sharma3 and Arpit Sikri4 Prosthodontics Management to Stabilize the Floating Mandibular Denture EC DENTAL SCIENCE June 15, 2020 .

24 Arslanov KS. Comparison of two impression methods for determining the neutral zone in edentulous patients Ibragimova FI. INTERNATIONAL JOURNAL ON HUMAN COMPUTING STUDIES: 2 March-April 2021

25 Rana NS. A Clinical Comparative Study of Two Different Materials Used in Recording Neutral Zone in Completely Edentulous Patients at Jaipur Dental College, Jaipur. Journal of Evolution of Medical and Dental Sciences. 2020 Feb 24;9(8):4.

CONTRIBUTIONS BY AUTHORS

1 Sumayia Qaiser:	Concept & Design of Study
2 Maimoona Siddiq, Aamir Rafique, Syeda Sameen Zehra:	Drafting
3 Sumayia Qaiser, Kiran Tariq, Waseem ullah Khan, Maimoona Siddiq:	Data Analysis
4 Syeda Sameen Zehra Rizvi, Maimoona Siddiq:	Revisiting Critically
5 Sumayia Qaiser, Syeda Sameen Zehra:	Final Approval of version