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Original Research

An evaluation of the position of the neutral zone in relation to the crest of mandibular alveolar ridge - An In-vivo study

Deepak Bhorgonde[1], K Nandakumar[2], Punit R S Khurana[3], V Santoshi Kumari[4], M Sushendar Reddy[5], Sabin Siddique[6]

Contributors:

[1]Professor, Department of Prosthodontics, SB Patil Dental College, Bidar, Karnataka, India; [2]Reader, Department of Prosthodontics, MES Dental College, Malappuram, Kerala, India; [3]Reader, Department of Prosthodontics, Institute of Dental Education and Advanced Studies, Gwalior, Madhya Pradesh, India; [4]Senior Lecturer, Department of Prosthodontics, MNR Dental College and Hospital, Sangareddy, Andhra Pradesh, India; [5]Senior Lecturer, Department of Prosthodontics, SVSIDS Dental College and Hospital, Mahabubnagar, Andhra Pradesh, India; [6]Senior Lecturer, Department of Public Health Dentistry, Yenepoya Dental College, Mangalore, Karnataka, India.

Correspondence:

Dr. Deepak Bhorgonde. Department of Prosthodontics, SB Patil Dental College, Bidar, Karnataka, India. Phone: +91 – 9844669652. Email: deepakbhorgonde22@gmail.com

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Abstract:

Background: In view of the importance of neutral zone in complete denture construction, it was thought feasible to determine the relation between the centre of the alveolar ridge crest in relation to the neutral zone in a buccolingual direction which will help in positioning of the teeth in a region of minimum conflict so that the stability of the denture is enhanced.

Materials & Methods: The position of the neutral zone to alveolar ridge crest was investigated in 30 edentulous patients comprising of both males and females divided into three groups, Group I consisted of ten patients whose period of edentulousness varied from 0-4 years. Group II included ten patients who were edentulous for more than 4 years but less than 8 years. Group III consisted of ten patients whose period of edentulousness varied between 8-12 years. One-way ANOVA test and multiple comparisons by bonferroni post-hoc tests were used to analyze the results and the significance was tabulated.

Results: The results of the present study state that the neutral zone serves as a guide and suggests that the period of edentulousness should be considered while arranging the teeth for complete dentures.

Conclusion: The findings of the current study may serve as an important guide in arrangement of teeth for complete denture prosthesis and would help to determine the correlation between the neutral zone in relation to the crest of the alveolar ridge and the period of edentulousness.

Key Words: Alveolar ridge, complete denture, edentulousness, neutral zone

Introduction

The ultimate goal of dentistry is to keep all the teeth of an individual healthy and in comfort throughout his life. If however teeth are lost despite all efforts to save them, the prosthesis should be fabricated in such a manner so as to function efficiently and comfortably in harmony with the muscles of the stomatognathic system and the temporomandibular joints.[1]

The primary objective of complete denture prosthesis is to construct dentures that will satisfy the three basic requirements of the edentulous patient: maximum comfort, efficiency and aesthetics. This objective can be achieved only if the dentures are both stable and retentive. Tooth position has also received considerable attention, but essentially from a purely mechanical or leverage point of view.[2]

Complete dentures are primarily mechanical appliances, but since they function in the oral cavity, they must be fashioned so that they are in harmony with the normal neuromuscular system. All oral functions- speech, mastication, swallowing, smiling, laughing involve the synergistic actions of the tongue, lips, cheeks and floor of the mouth, which are very complex and highly individual in themselves. Failure to recognize cardinal importance of tooth position, flange form and contour may result many times in dentures that are unstable and unsatisfactory, even though skillfully designed and expertly constructed. The coordination of complete dentures with neuromuscular function is the foundation of successful stable dentures that is accomplished by utilizing the neutral zone concept.[3]

Neutral zone is the zone of minimum conflict, where during function, the forces of the tongue pressing outward are neutralized by the forces of the cheeks and lips pressing inward. Since these forces are developed through muscular contraction during the various functions of chewing, speaking and swallowing, they vary in magnitude and

direction in different individuals. The soft tissues that form the internal and external boundaries of the denture space exert forces that greatly influence the stability of the dentures. The central thesis of neutral zone approach to complete dentures is to locate that area in the edentulous mouth where the teeth should be positioned so that the forces exerted by muscles will tend to stabilize the denture rather than unseat it.[4]

As the area of the impression surface decreases and the polished surface area increases, tooth position and contour of the polished surface become more critical. In other words, where more of the alveolar ridge has been lost, denture stability and retention are more dependent on correct positions of the teeth and contour of the external surfaces of the dentures.[5, 6]

In view of the importance of neutral zone in complete denture construction, it was thought feasible to determine the relation between the centres of the alveolar ridge crest in relation to the neutral zone in a buccolingual direction which would will help in positioning of the teeth in a region of minimum conflict so that the stability of the denture is enhanced.[7]

Materials and Methods

The position of the neutral zone to alveolar ridge crest was investigated in 30 edentulous patients comprising of both males and females. These patients were divided into three groups, Group I consisted of ten patients whose period of edentulousness varied from 0-4 years. Group II included ten patients who were edentulous for more than 4 years but less than 8 years. Group III consisted of ten patients whose period of edentulousness varied between 8-12 years. The subjects selected based on the criteria for inclusion were

1. Completely edentulous patients with edentulousness extended upto 12 years
2. Absence of clinical temporomandibular joint disorders.
3. Absence of intraosseous pathoses or defects.
4. Absence of diseases of bones and joints.

Preparation of Record base

Mandibular master cast was prepared in dental stone. Base of the cast was made parallel to the residual ridge with the help of a model trimmer. A 25-gauge stainless steel wire was adapted through the crest of the residual ridge on the mandibular cast. This was secured in place with the help of commercial glue. Undercuts were blocked, and recording bases were prepared in auto polymerizing acrylic resin by sprinkle on technique. The acrylic resin was allowed to polymerize in water bath at 37° C for 15 min. Recording bases were separated from the cast, finished and polished. The recording bases were tried in the patient's mouth and checked for comfort, retention, stability and extension.

Locating the neutral zone of the mandibular arch with soft putty:

Vinyl polysiloxane soft putty impression material [Affinis: Coltene-whaledent company] was used for this purpose. The putty is supplied as two jars of base and catalyst materials. Equal quantities of base and catalyst materials were dispensed and mixed together with fingers. The material was thoroughly kneaded until the mix was uniformly coloured. A roll was formed and was placed on mandibular record base. The material was shaped and fitted onto the tray along the crest of the record base. Posteriorly the height of the rim was kept at two thirds of the retro molar pad. A small amount of material was manipulated along the labial, buccal and lingual slopes.

The tray with putty rim was rotated into the mouth and carefully seated. Care was taken so that the lips do not press against the material until it was completely seated. The patient was instructed to do swallowing, sucking and various other functional movements of the cheeks and tongue. During the function of the cheeks, lips and tongue the forces exerted on the material moulded it into the neutral zone. After the setting of material, recording base was taken out of the mouth. It is important that only an adequate amount of material be used for this procedure, as the usage of an excessive amount would force the material forward and upward above the normal height of the occlusal plane.

The stability of the rim is tested by asking the patient to open the mouth wide, wet the lips with the tongue, count from 1 to 10 and say exaggerated 'Ohs', 'ahs' and 'ees'. If this movement raises the rim, it shows that the lack of stability must have been caused by improper moulding of the putty material, which was placed on a stable base. The body moulding procedure is repeated and tested until a stable rim is achieved. The lower denture base with the neutral zone recording was then carefully carried outside the mouth.

Radiographic assessment of Neutral zone

A 22-gauge stainless steel wire was adapted on the occlusal surface of the occlusal rim and later embedded along the

centre of the entire length of occlusal rim. Now an occlusal view radiograph of the recording base was taken so that the radiographic images of both the wires were obtained. The source to object distance was standardized at 12cms and the central ray was directed at the centre of the cast. Exposure parameters used were 70 kilovolts peak, 8ma, 20 impulses, and 1 sec exposure time. All the films were developed in an automatic processor.

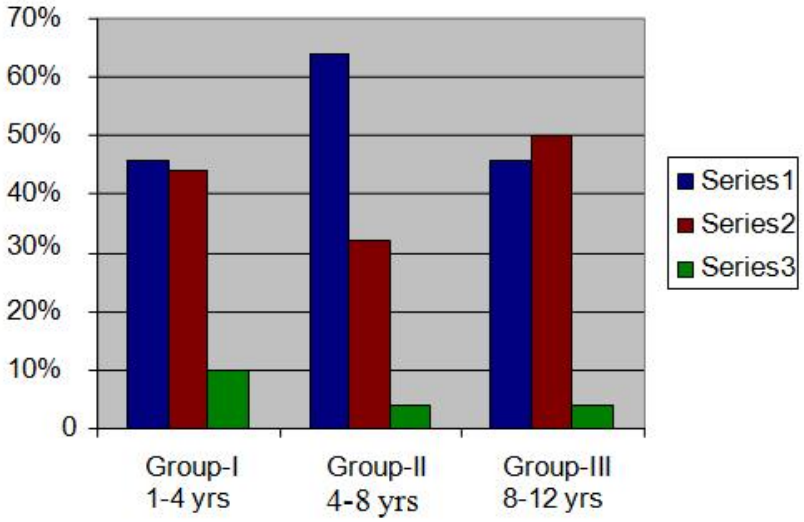
Each film was examined for the relationship between the images of these two wires in a buccolingual direction. If both the images of the two wires coincided, a zero score was assigned. Buccal or labial location of neutral zone wire with respect to the wire indicating the centre of the ridge in the anterior, premolar and molar region was assigned a positive value. The location of the neutral zone wire lingual to the crest of the ridge was assigned a negative value. Measurements were made in a millimeter scale to an accuracy of 0.5 mm. The position of neutral zone to alveolar ridge was measured in five different locations viz., the anterior, premolar and molar in the left and right region. In this manner 30 samples were obtained. Statistical analysis was carried out using one-way ANOVA test and multiple comparisons by bonferroni post-hoc tests.

Results

The basic data collected from 30 patients to correlate the position of the neutral zone in relation to the crest of the ridge is presented in Tables 1 to 3. The patients were classified according to their period of edentulousness into three groups. The first group was edentulous for 0-4 years, the second group for 4-8 years and third group for 8-12 years.

Table 1:

Shows position of neutral zone to the crest of alveolar ridge in 5 different locations for patients edentulous between 1 to 4 years. In 23 locations (46%) the neutral zone was located lingual to the crest of the ridge. In 22 locations (44%) the neutral zone was located buccally or labially. In 5 locations (10%) the neutral zone coincided with the crest of the alveolar ridge. (Graph 1: Group-I)



Graph 1: Showing patients divided into 3 groups.

Series 1- Lingual position of the neutral zone.
Series 2- Labial/Buccal position of the neutral zone.
Series 3- Neutral zone coincides with ridge crest.

Table 2:

Shows position of the neutral zone to the crest of the alveolar ridge for patients edentulous between 4-8 years. In 32 locations (64%) the neutral zone was located lingual to the crest of the ridge. In 16 locations (32%) the neutral zone was located buccally or labially. In 2 locations (4%) the neutral zone coincided with the crest of the alveolar ridge. (Graph-1: Group-II)

Table 3:

Shows position of the neutral zone to the crest of the alveolar ridge for patients edentulous between 8-12 years. In 23 locations (46%) the neutral zone was located lingual to the crest of the ridge. In 25 locations (50%) the neutral zone was located buccally or labially. In 2 locations (4%)

Table 1: Shows position of neutral zone to the crest of alveolar ridge in 5 different locations for patients edentulous between 1 to 4 years.

Number of Cases	Period of edentulousness	Left molar region	Left premolar region	Anterior region	Right premolar region	Right molar region
1	.50	-1.00	-1.00	1.00	0.50	-2.00
2	.50	-2.00	-1.00	1.00	1.00	-2.50
3	1.00	1.00	1.50	1.00	-0.50	0.00
4	1.00	2.00	1.50	1.00	-0.50	0.50
5	1.50	-2.50	-2.00	0.00	0.50	-1.00
6	2.00	-1.50	1.00	-1.00	-1.00	1.50
7	2.50	1.50	0.50	-1.00	2.00	-2.50
8	3.00	-2.50	-1.00	0.50	0.00	-2.00
9	3.00	-2.50	-1.50	1.00	0.00	-2.00
10	4.00	-1.00	1.50	1.00	1.50	0.50

Table 2: Shows position of neutral zone to the crest of alveolar ridge for patients edentulous between 4-8 years.

Number of Cases	Period of edentulousness	Left molar region	Left premolar region	Anterior region	Right premolar region	Right molar region
1	4.50	-2.50	-0.50	1.00	-1.50	-1.50
2	4.50	-2.50	-0.50	1.00	-1.50	-1.50
3	5.00	-3.00	0.50	-0.50	1.50	2.50
4	5.50	-1.50	-1.00	0.50	0.00	-2.00
5	5.50	-2.00	-0.50	1.00	-0.50	-2.50
6	6.00	0.50	1.50	1.50	1.50	-1.50
7	6.50	-1.00	1.00	-1.00	1.00	-0.50
8	7.00	-0.50	-1.50	-0.50	-2.00	0.00
9	7.50	-3.00	-1.50	1.50	0.50	-2.50
10	8.00	-1.50	-0.50	2.50	-1.50	-2.00

Table 3: Shows position of neutral zone to the crest of alveolar ridge for patients edentulous between 8-12 years.

Number of Cases	Period of edentulousness	Left molar region	Left premolar region	Anterior region	Right premolar region	Right molar region
1	8.50	-3.00	-1.50	2.00	-1.00	-2.00
2	8.50	-3.00	-1.00	2.00	-1.50	-2.00
3	9.00	1.50	1.50	1.50	1.50	-0.50
4	9.50	0.00	1.00	0.50	1.50	1.50
5	10.00	-2.00	-1.50	-0.50	-1.50	-2.00
6	11.00	-1.00	1.50	2.50	2.00	-1.50
7	11.00	0.50	1.50	2.50	2.50	-2.00
8	12.00	-3.50	0.50	2.00	1.00	-3.00
9	12.00	-3.00	0.00	2.50	1.50	-2.50
10	12.00	-3.50	0.50	2.50	2.00	-3.00

the neutral zone coincided with crest of the alveolar ridge. (Graph-1: Group-III)

Table 4:

It depicts the mean, standard deviation and significance of the position of the neutral zone to the crest of the alveolar

ridge in 5 different locations for patients edentulous between 1-4 years. In the molar region the neutral zone was found to be located lingual to the crest of the ridge by a mean ranging from -0.85 to -0.95. The neutral zone was found to be located buccal to the crest of the ridge by a mean ranging from 0 to 0.35 in the premolar region and 0.45 in the anterior region. The table shows a significant deviation ranging from p= 0.006 to 0.030 in the molar region, p= 0.003 to 0.008 in the premolar region and p= 0.012 in the anterior region.

Table 4: Shows the mean, standard deviation and significance of the position of the neutral zone to the crest of the alveolar ridge in 5 different locations for patients edentulous between 1-4 years.

	Left molar region	Left premolar region	Anterior region	Right premolar region	Right molar region
Mean	-0.85	0.00	0.45	0.35	-0.95
Std Deviation	1.73	1.38	0.83	0.94	1.46
Sig (P)	0.030	0.003	0.012	0.008	0.006

Table 5:

Shows mean, standard deviation and significance of the position of the neutral zone to the crest of the alveolar ridge in 5 different locations for patients edentulous between 4-8 years. The neutral zone was found to be located lingual to the crest of the ridge by a mean ranging from -1.15 to -1.70 in the molar region and -0.25 to -0.30 in the premolar region. The neutral zone was found to be located buccal to the crest of the ridge by a mean of 0.70 in the anterior region. The table shows a significant deviation ranging from p = 0.021 to 0.037 in the molar region, p = 0.027 to 0.047 in the premolar region and p = 0.041 in the anterior region.

Table 5: Shows the mean, standard deviation and significance of the position of the neutral zone to the crest of the alveolar ridge in 5 different locations for patients edentulous between 4-8 years.

	Left molar region	Left premolar region	Anterior region	Right premolar region	Right molar region
Mean	-1.70	-0.30	0.70	-0.25	-1.15
Std Deviation	1.14	1.01	1.09	1.34	1.51
Sig (P)	0.037	0.047	0.041	0.027	0.021

Table 6:

Shows mean, standard deviation and significance of the position of the neutral zone to the crest of the alveolar ridge in 5 different locations for patients edentulous between 8-12 years. In the molar region the neutral zone was found to be located lingual to the crest of the ridge by a mean ranging from -1.65 to -1.70. The neutral zone was found to be located buccal to the crest of the ridge by a mean ranging from 0.25 to 0.80 in the premolar region and 1.75 in the anterior region. The table shows a significant deviation ranging from p= 0.001 to 0.008 in the molar region, p= 0.002 to 0.005 in the premolar region and p= 0.001 in the anterior region.

Table 6: Shows the mean, standard deviation and significance of the position of the neutral zone to the crest of the alveolar ridge in 5 different locations for patients edentulous between 8-12 years.

	Left molar region	Left premolar region	Anterior region	Right premolar region	Right molar region
Mean	-1.70	0.25	1.75	0.80	-1.65
Std Deviation	1.83	1.21	1.01	1.53	1.34
Sig (P)	0.008	0.002	0.001	0.005	0.001

Table 7:

Shows comparison between the positions of neutral zone of each location between Groups I, II and III. The table shows a significant deviation of p = 0.001 in the molar region and in the anterior region. But premolar region shows a non-significant deviation in range of 0.210 to

Table 7: One Way ANOVA tests.	
Location	**Sig**
Left molar	0.001
Left premolar	0.249
Anterior	0.001
Right premolar	0.210
Right molar	0.001

Table 8: Bonferroni - Multiple Comparisons.			
Location	**Groups**		**Sig**
Left molar	Group I	Group II	0.020
		Group III	0.002
	Group II	Group III	0.027
Left premolar	Group I	Group II	0.818
		Group III	0.314
	Group II	Group III	0.995
Anterior	Group I	Group II	0.016
		Group III	0.001
	Group II	Group III	0.050
Right premolar	Group I	Group II	0.928
		Group III	0.325
	Group II	Group III	0.985
Right molar	Group-I	Group-II	0.025
		Group-III	0.001
	Group-II	Group-III	0.029

0.249. These findings were obtained statistically using one-way analysis of variance tests.

Table 8:

Shows the significance of correlation of the position of neutral zone among different groups. For each position, intergroup comparison was done statistically using Bonferroni post-hoc test. The results showed that the neutral zone positions in right and left molar regions varied significantly among the three groups. Anterior region also showed significant variation among the groups. The premolar region showed a non-significant deviation between all the three groups.

Discussion

The concept of neutral zone plays an important role in complete denture fabrication.[1,2,8] The need for neutral zone was stressed as early as 1931 by Fish[9, 10] and 1954 by Earl Pound.[11] The present study attempts to relate the position of the neutral zone to the crest of the ridge in a buccolingual direction and its relation to the period of edentulousness.

The neutral zone is defined as "the potential space between the lips and cheeks on one side and tongue on the other, that area or position where the forces between the tongue and cheeks or lips are equal". This zone is referred to by various names, including "dead space" or "zone of minimal conflict".[4] The soft tissues that form the internal and external boundaries of the denture space exert forces, which greatly influence the stability of the dentures. The central thesis of the neutral zone approach to complete dentures is to locate that area in the edentulous mouth where the teeth should be positioned so that the forces exerted by the muscles will tend to stabilize the denture rather than unseat it.

For many years prosthodontists have been trying to find out the ideal location of the teeth during complete denture fabrication. Literature is abundant which advocate the need for positioning the teeth in the neutral zone. In spite of its usefulness there are not many investigations that attempt to locate the neutral zone to lower ridge and correlate it with the period of edentulousness, which may guide the placement of teeth. Keeping this in mind, this study was conducted to ascertain the position of the neutral zone in relation to the crest of the ridge by a radiologic photographic method. The neutral zone varied from person to person depending on the musculature and the resorption pattern. The method used in this study would be beneficial in these instances to locate the ridge-neutral zone relation.

Polyvinyl siloxane soft putty impression material was used for this study. The material is soft, easily mouldable by the forces of tongue and circumoral muscles and has got sufficient working time and therefore can be used to accurately locate the neutral zone. Moreover direct occlusal view of the cast is obtained to measure the location of the neutral zone with respect to the alveolar ridge. This method minimizes distortion of the radiograph that can cause error in the measurement.

The result obtained from this study on patients with edentulous period upto four years showed the neutral zone to be located labially by a mean of +O.45mm in the anterior region (Table 6). It indicates the need to place the mandibular anterior teeth more labially in patients who are edentulous upto four years. This finding is in agreement with the study conducted by Lammie G.A in 1956.[12]

The neutral zone in the anterior region was found to be labially located by a mean of +0.70 mm in patients who were edentulous between four to eight years (Table 5). This means that the neutral zone was located more labial to the crest of the ridge. Accordingly the anterior teeth should be positioned more labially to the crest of the ridge for patients in this group compared to the former group. However, phonetics and aesthetics should be considered while setting anterior teeth. Fahmi F.M also arrived at a similar conclusion from his study in 1991.[7]

The neutral zone in the anterior region was found to be labially located by a mean of +1.75 mm in patients who were edentulous between eight to twelve years (Table 6). This means that the neutral zone was located even more labial to the crest of the ridge. Accordingly the anterior teeth should be positioned more labially to the crest of the ridge for patients in this group compared to the former two groups.[13,14]

As the period of edentuloussness increases, the location of the neutral zone changes more towards labial. This is because anterior mandibular residual ridge resorbs lingually as time lapses. The neutral zone in premolar region in patients who were edentulous for less than 4 years was found to be located buccally by a mean ranging from 0.00 to +0.35 (Table 4). In this region, the neutral zone was located slightly buccal to the crest of the ridge. So it is important that the premolar teeth be positioned slightly buccally to the ridge crest for cases belonging to this group.[7,15,16]

The neutral zone in premolar region in patients who were edentulous between 4 to 8 years was found to be located slightly lingual by a mean ranging from -0.25 to -0.35 (Table 5). Here the neutral zone was located slightly lingual to the crest of the ridge. So the premolar teeth should be positioned slightly lingual to the ridge crest for cases belonging to this group.[17]

The neutral zone in premolar region in patients who were edentulous between eight to twelve years was found to be located buccal by a mean ranging from +0.25 to +0.80 (Table 6). This means the neutral zone was located buccal to the crest of the ridge for patients edentulous between eight to twelve years. Accordingly the premolar teeth should be positioned slightly buccally to the ridge crest for cases belonging to this group.

The resorption of the ridge in the premolar region is almost equal from buccal and lingual sides. So the position of the neutral zone does not vary considerably in the premolar region, which is in agreement with the study conducted by Weinberg in 1958.

The result obtained from this study on patients with edentulous period of upto 4 years showed the neutral zone to be located lingually by a mean ranging from -0.85 to -0.95 in the molar region (Table 4), which necessitates the need to place the mandibular molar teeth lingually.[7,18,19]

The neutral zone in molar region in patients who were edentulous between 1.15 to -1.70 (Table 5). Here the neutral zone was located more lingual to the crest of the ridge for these patients. So the molar teeth should be positioned more lingually to the ridge crest for cases belonging to this group.

The neutral zone in the molar region was found to be lingually located by a mean ranging from -1.65 to -1.70 mm in patients who were edentulous between 8 to 12 years (Table 6). This means that the neutral zone was located even more lingual to the crest of the ridge. Accordingly the molar teeth should be positioned more lingually to the crest of the ridge for patients in this group compared to the former two groups.[7,20,21]

As the period of edentulousness increases, the mandibular ridge resorbs from the lingual side in the molar region. By this pattern of resorption the arch will become wider in the posterior region. So the position of the neutral zone is lingual to crest of the alveolar ridge.[22] So mandibular posterior teeth should be placed towards the lingual side and the discrepancy in this position increases as time

lapses, this is in accordance to Martone's (1963) [21,23] conclusions.

Findings of Wright.C.R (1966) showed that if the sizes of the mandibular teeth are too large (buccolingually) or if the posterior teeth are set even 1 mm lingually, the tongue is deprived of approximately 1000 mm^3 of its functional space. This can force the tongue into an abnormally retracted position. In addition, the transformation from the dentulous to edentulous state causes one-tenth increase in tongue size. He indicated that the mandibular denture would receive more tongue pressure as a result of this increase in size.[24] These factors should be considered while placing posterior teeth in dentures. The location of neutral zone assists in these instances for the correct placement of posterior teeth.[25, 26]

The neutral zone in the molar region shows a significant deviation of p=0.001 among the three different groups[1] (Table 7). This indicates that the position of the neutral zone changes significantly among the three groups and changes towards the lingual side compared to the crest of the edentulous ridge. This necessitates positioning the lower molars more lingually as the period of edentulousness increases. The position of the neutral zone in the molar region shows a significant deviation ranging from p=0.020 to 0.025 between Group-I and Group-II, p=0.001 to 0.002 between Group-I and Group-III and p=0.027 to 0.029 between Group- II and Group- III. This shows that the position of the neutral zone in the molar region varies significantly among all the three groups (Table 8). This is in agreement with the findings drawn by Khamis M, Razek A and Abdalla F in 1981.

The neutral zone in the anterior region shows a significant deviation of p=0.001 among the three different groups[7] (Table 7). This indicates that the position of the neutral zone changes significantly among the three groups and changes towards the labial side compared to the crest of the edentulous ridge. This necessitates positioning the lower anteriors more labially as the period of edentulousness increases. The position of the neutral zone in the anterior region shows a significant deviation of p=0.016 between Group-I and Group-II, p=0.001 between Group-I and Group-III and p=0.050 between Group-II and Group- III. This shows that the position of the neutral zone in the anterior region varies significantly among all the three groups (Table 8). This is in agreement with the findings drawn by Lammie G. A in 1959.[14]

The neutral zone in the premolar region shows a non-significant deviation ranging from p=0.210 to 0.249 among the three different groups (Table 7). This indicates that the position of the neutral zone does not change significantly among the three groups. The position of the neutral zone in the premolar region shows a non-significant deviation ranging from p=0.818 to 0.928 between Group-I and Group-II, p=0.314 to 0.325 between Group-I and Group-III and p=0.985 to 0.995 between Group- II and Group- III. This shows that the position of the neutral zone in the premolar region does not vary significantly among all the three groups (Table 8). This may be due to the fact that resorption pattern of the mandible in the premolar region is almost equal from buccal and lingual sides. As a result premolar position does not change considerably compared to the crest of the edentulous ridge. This is in agreement with the findings drawn by Murray C.J in 1978.

Thus this study brings to light the importance of the period of edentulousness and its usefulness in the arrangement of teeth. During the placement of teeth, consideration must be given to the structural losses and changes that take place due to resorption. After the loss of natural teeth the maxillary ridge apparently moves lingually and mandibular ridge buccally. The mandible also usually exhibits atrophy to a much greater extent than the maxilla. As a result there will be a decrease in the denture bearing area buccally and labially in the mandibular ridge.[19]

The neutral zone approach registers the zone of minimum conflict to determine the proper placement of teeth after resorption has taken place. In the absence of neutral zone principle the location of teeth are purely arbitrary. The awareness of neutral zone has been given importance due to increased risk of instability of the lower denture.[27] The standard approach of placing the artificial teeth on the crest of the ridge is not in any means true to the original location of natural teeth. In other words, we should not be dogmatic in insisting that teeth should always be placed over the crest of the ridge or lingual to the crest of the ridge to obtain favourable teeth to ridge relation. The placement of teeth should be dictated by the lingual and buccal musculature, which will vary from patient to patients.

Complete denture prosthesis constructed using the concept of neutral zone results in a denture, which is in harmony with these lingual and buccal musculatures. The results obtained from this study serves as a guideline for

the bucco-lingual placement of artificial teeth in complete dentures.

Conclusion

The present study was carried out to determine the correlation between the neutral zone in relation to the crest of the alveolar ridge and the period of edentulousness.

1. In patients with history of less than 4 years of edentulousness, the neutral zone was located slightly lingual to the crest of the ridge in the molar region and slightly labial to the crest of the ridge in the anterior region.
2. As the period of edentulousness increases, the position of the neutral zone changes more towards lingual in the molar region and more towards labial in the anterior region, with respect to crest of the residual ridge.
3. The position of the neutral zone remains more or less constant in the premolar region with respect to crest of the residual ridge.
4. The position of the neutral zone in relation to the alveolar ridge was found to be highly affected by the period of edentulousness.

Since neutral zone serves as a guide, it is suggested that the period of edentulousness should be considered while arranging the teeth for complete dentures. The findings of this study may serve as an important guide in arrangement of teeth for complete denture prosthesis.

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