

Evaluate and measure the changes in retention of mandibular denture by determining the effect of tongue movement on depth & width of anterior lingual flange

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Abstract

Background: To evaluate the changes in retention of mandibular denture by determining the effect of tongue movement on depth & width of anterior lingual flange.

Materials & Methods: A total of 10 healthy male and female edentulous subjects were chosen from the outpatient department. The mean age was 59.58 years. A two-tailed test was used for data obtained by measuring vestibular depth and width at five different locations from the center of crest using periodontal probe and Boley's gauge and, the testing apparatus was used to measure magnitude of forces required to dislodge the denture bases. The result was analysed using SPSS software.

Results: The conventional border molding technique was used for the patients and range of mean depth of alveolo-lingual sulcus was 1.5 mm to 5.5 mm with standard deviation of ± 0.48210 , indicating statistically significant result in retention, mean vestibular depth and width of denture bases after conventional border molding.

Conclusion: There is a significant change in the retention of mandibular denture and, also on the depth and width of anterior lingual flange by asking the patient to do wide range of tongue movements. Thus, it's very important to make the patient do the right tongue movements for recording anterior lingual space to provide seal for better retention and stability of lower denture during functional movements.

Keywords: border moulding, impression technique, retention.

Introduction

Complete dentures are primarily mechanical devices but since they function in the oral cavity, they must be fashioned so that they are in harmony with the stomatognathic system. The wearing of complete dentures may have adverse effects on the denture supporting tissues as well as surrounding musculature.¹ Residual ridge resorption is a complex biophysical process and a common occurrence following extraction of teeth. Ridge atrophy is most dramatic during the first year after tooth loss followed by a slower but more progressive rate of resorption thereafter.^{2,3} Making a definitive impression of an edentulous arch can be challenging when the residual ridges present are less than ideal. The mandibular denture usually poses more problems while impression making as compared to maxillary denture owing to the smaller surface area coverage of the foundation tissues. Also, the problem of retention and stability is more pronounced with mandibular denture as compared to the maxillary

denture because the mandibular covered surface area is approximately half to that in the maxillary arch, and the presence of palate in maxillary arch adds more area for retention. On the other hand, the mobility of tongue on the floor of the mouth in the mandibular arch poses a problem in attaining proper lingual seal while impression making of lower arch. A complete mandibular denture is said to be stable if it is entirely and continuously under the patient's functional control. The patient should be able to eat comfortably and with minimal movement of the denture relative to its foundation area. The retentive dentures can be fabricated in the majority of the patients regardless of the condition of the ridge. It is mainly the stability of the denture that is limited by the ridge conditions. Stability is the quality of a removable prosthesis to be firm, steady, or constant to resist displacement by functional horizontal or rotational stresses.^{4,5} Literature suggests that some important factors dealing with a patient with an unfavorable mandibular ridge are appropriate tongue position which is forward and resting on top of lower anterior ridge maintaining a

lingual border seal and proper use of lingual spaces for retention of denture especially the sublingual crescent space. Tissue bounding this space moves freely, so that anterior lingual flange can be extended horizontally.⁶⁻⁸ In addition to retention, functional considerations caused by movement of tongue substantially influence the tolerable width and depth limits of anterior lingual flange. The dental literature fails to provide research that establishes the quantitative influence that properly extended anterior lingual flange has on denture retention.⁹ Hence, this study was conducted to measure the changes in retention of mandibular denture by determining the effect of tongue movement on depth & width of anterior lingual flange.

Materials & Methods:

A total of 10 healthy male and female edentulous subjects were chosen from the outpatient department.

The mean age was 59.58 years. The basic data was collected from 10 patients on denture bases obtained by conventional border molding as vestibular depth and width of alveolo-lingual sulcus at five different locations as well as retention of denture bases by measuring retentive forces used for dislodging the denture bases. A two-tailed test was used. The result was analysed using SPSS software. The p-value < 0.05 indicates a significant difference.

Results:

The conventional border molding technique was used and range of mean depth of alveolo-lingual sulcus was 1.5 mm to 5.5 mm with standard deviation of ± 0.48210 . Range of mean width of alveolo-lingual sulcus was 2.0 mm to 7.5 mm with standard deviation of ± 0.74521 .

Table 1: Vestibular depth (mm) of alveolo-lingual sulcus at five different locations obtained by using conventional border moulding technique

No. of Subjects	M	L ₁	L ₂	R ₁	R ₂	Mean	Std. Deviation
1	2.0	3.5	3.5	2.0	4.0	3.2000	0.58932
2	3.5	3.0	4.5	3.0	5.5	3.5000	0.48902
3	3.0	4.0	4.5	5.0	5.0	4.0000	0.86402
4	2.5	4.0	3.5	5.0	4.5	3.6000	0.84207
5	2.0	2.5	4.5	3.5	5.0	3.1000	0.50942
6	3.5	4.5	5.0	3.5	5.0	4.2000	1.18520
7	3.0	3.5	4.5	4.0	4.5	4.8000	0.95402
8	2.0	2.5	3.5	3.5	4.0	3.4000	0.62431
9	2.5	4.5	5.5	3.0	4.5	3.9000	0.75203
10	3.0	2.0	3.0	2.5	3.0	3.1000	0.72560
Mean	3.600						
Range	1.5-5.5						
S.D.	± 0.48210						

Table 2: Vestibular width (mm) of alveolo-lingual sulcus at five different locations obtained by using conventional border molding technique

No. of Subjects	M	L ₁	L ₂	R ₁	R ₂	Mean	Std. Deviation
1	3	4	5	4	4	3.7000	0.95244
2	2.5	4	4.5	4	4.5	4.1000	0.78520
3	3	3.5	4.5	4.5	6	4.5000	1.35820
4	2	4	4.5	3.5	5.5	3.7000	0.78541
5	3.5	4.5	5	4.5	6	4.9000	1.22509
6	2	4	4	3.5	4.5	3.7000	0.71025
7	3.5	4	5.5	4	5.5	4.2000	0.75620
8	3	4	3.5	4	5	3.7000	0.95842
9	3.5	4	5.5	4.5	5.5	4.7000	1.58218
10	2.5	3.5	4.5	5	5	4.5000	0.85240
Mean	4.58420						
Range	2.0 – 7.5						
S.D	± 0.74521						

Table 3: Retention of mandibular denture bases fabricated using conventional technique

Patient No.	Reading 1 (in gms)	Reading 2 (in gms)	Reading 3 (in gms)	Mean (in gms)	S.D.±
1	73	78	76.8	79.5200	2.05213
2	34	36.5	37.2	38.5204	3.52032
3	42	45	43.4	43.5820	1.83308
4	12.5	11.4	12.5	11.6478	1.06524
5	21.54	21	28.5	24.5205	1.85414
6	62.8	60	64	61.6742	1.09420
7	43.4	45	42	44.5201	0.54205
8	21	24.2	19.4	20.5401	4.42089
9	71.8	74	70	69.1000	1.20540
10	22.7	22.9	21	22.8542	1.08521
Mean	37.5204				
Range	12.0-82.0				
S.D.	± 19.45824				
Range of Means	12.0-79.52				

Range of mean for retention of mandibular denture bases fabricated was 12.0grams to 79.52 grams and standard deviation of ± 19.45824 .

Discussion:

In lower complete dentures, labial and buccal flanges provide good peripheral seal in the area of lower lip and cheek which fall over it. Loss of peripheral seal frequently occurs in anterior part of alveolo-lingual sulcus because of loss of contact of denture flange with sublingual tissue which changes its shape along with protruding and retruding tongue movements resulting in compromised retention.¹⁰⁻¹² Hence, this study was conducted to measure the changes in retention of mandibular denture and to determine the effect of tongue movement on depth & width of anterior lingual flange. In the present study, a total of 10 subjects were enrolled. The conventional border molding technique was used and range of mean depth of alveolo-lingual sulcus was 1.5 mm to 5.5 mm with standard deviation of ± 0.48210 . A study by Brill N, Tryde G, Schubeler S (1959) reviewed the role of exteroceptors in denture retention and concluded that the normal activity of muscle is dependent upon afferent impulses originating in proprioceptors recording changes in muscles, tendons, and joints, and impulses originating in exteroceptors, which record changes in the external environment. The touch receptors found in the mucosa of the oral cavity, including those of the tongue, are particularly concerned with denture retention and these

receptors are of great importance in the precisely adjusted muscular coordination of cheeks, lips, and tongue.¹³ In the present study, range of mean width of alveolo-lingual sulcus was 2.0 mm to 7.5 mm with standard deviation of ± 0.74521 . Range of means for retention of mandibular denture bases fabricated was 12.0grams to 79.52 grams and standard deviation of ± 19.45824 . Another study by Stomberg WR, Hickey JC (1965)²⁹ compared the retention of physiologically and manually formed denture bases by fabricating two pairs of complete dentures for a group of subjects with one pair having manually formed external surface in accordance with oral anatomy and another pair having polished external surface formed functionally by the patient. The dentures were tested for retention after three variations in wearing conditions: (1) after they had been left out of mouth for 24 hours (2) tested after the dentures with manually formed bases had been worn for at least 2 consecutive days. (3) dentures tested after the dentures with functionally formed external surfaces had been worn for at least 2 consecutive days and concluded that there was no significant difference between the retention of two forms of maxillary or mandibular dentures or among the three testing conditions.¹⁴ Lindstrom RE, Pawelchak J, Heyd A, Tarbet WJ. (1979) revealed that the physical-chemical mechanism of retention of dentures is a highly complex one. A review of the literature suggests that retention also is a personal phenomenon under the control of numerous factors. The main factors involved in the retention of a well-adapted denture are the forces

related to the wetting of the denture and of the mucosal surfaces and the cohesive or intermolecular characteristics of the saliva.¹⁵

Border molding was done using low fusing compound because of its ease of manipulation and ability to record borders accurately in increments. It was easily available, cost effective and corrections or additions of the earlier molded segments can be easily accomplished as compared to elastomeric materials.¹⁶ Borders of the tray were molded to proper extensions by manual and functional movements in conventional manner.¹⁶ But in patients with atrophic mandibular ridge, the supporting area of complete denture affects the amount of retention and become more dependent on the contours of external surface of dentures.¹⁷ In lower dentures, higher forces exerted onto anterior lingual surface contributes greatly to their muscular retention. These pressures were higher in anterior surfaces, therefore for effective retention, contour of polished surface should be more favorable anteriorly than distally.¹⁸

Conclusion:

There is a statistically significant result in retention, mean vestibular depth and width of denture bases after conventional border molding and considering functional tongue movements. A significant change in the retention of mandibular denture was seen with tongue movements during border moulding. In addition to retention, functional considerations caused by movement of tongue substantially influence the tolerable width and depth limits of anterior lingual flange.

Thus, it's very important to make the patient do the tongue movements for recording anterior lingual space and establish lingual seal for better retention of lower complete denture during functional movements.

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