Measure the changes in retention of mandibular denture with extension in sublingual region, evaluate the impression method best suited for patients with mandibular ridge resorption

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Abstract

Background: Tomeasure the changes in retention of mandibular denture with extension in sublingual region and evaluate the impression method best suited for patients with mandibular ridge resorption.
Materials & Methods:A total of 15 subjects were enrolled. The mean age of subjects was 60.52 years. The subjects were divided with impression of denture bases as group A using conventional technique and group B as mandibular denture bases fabricated using sublingual extension.
Results:A total of 15 subjects were enrolled. Range of means for group A was 11.0 grams to 75.50 grams and standard deviation of ±22.5204.
Conclusion: There was a statistically significant increase in retention, mean vestibular depth and width of denture bases after border molding with sublingual extension as compared to denture bases with conventional border molding.

Keywords: mandibular denture, ridge resorption, retention.

Introduction

In complete denture philosophies, perpetual challenge to both general practitioner and prosthodontist is to deal with ridge resorption resulting in lack of stability and retention of dentures. The recognition, understanding and incorporation of certain mechanical, biologic and physical factors are necessary to ensure optimal complete denture treatment to promote the properties of retention, stability and support in the finished prosthesis through their influence on the relationship between the tissue surface of denture base and mucosal surface of edentulous ridges.[1] Complete denture retention is widely regarded as contributing significantly to a patient's adaptive prosthesis-wearing experience and mandibular complete denture poses significant challenge in achieving this objective.

Retention of complete denture prosthesis contributes dramatically to patient's acceptance of finished prosthesis.[1] The adaptation of denture borders to the surrounding, draping tissues at the time of their contraction is an important factor for attainment of optimal, comfortable and long lasting retention of complete dentures. [2] One determinant of such a clinical result is optimal border molding of the denture's periphery, which leads to a seal created by closely adapting the denture to its surrounding tissues. [3] The mandibular denture generally presents major problem with regard to retention because of movable floor of mouth, which causes difficulty in establishing a lingual border seal, and lack of ideal ridge height and conformation i.e., resorption of mandibular ridge, which further compromises retention and stability.[1,4,5] In lower complete dentures, the labial and buccal flanges provide good peripheral seal in area of lower lip and cheek which fall over it. Loss of peripheral seal frequently occurs in anterior part of alveololingual sulcus because of loss of contact of denture flange with sublingual tissue which changes its shape along with protruding and retruding tongue movements.[6] The loss of peripheral seal and hence loss of retention is more severe with extremely resorbed ridges. Extending the anterior lingual flange of lower denture sublingually makes it possible to achieve satisfactory retention in severely resorbed ridges. [6] Hence, this study was conducted to measure the changes in retention of mandibular denture with extension in sublingual

region,and evaluate the impression method best suited for patients with mandibular ridge resorption.

Materials & Methods:

A total of 15 subjects were enrolled. The mean age of subjects was 60.52 years. The subjects were divided with impression of denture bases as group A using conventional technique and group B as mandibular denture bases fabricated using sublingual extension.The independent samples t-test is used when two separate sets of independent and identically distributed samples are obtained, one from each of the two populations being compared. The basic data was collected from twenty patients on two denture bases obtained by conventional border molding and border molding with sublingual extension to compare retention of denture bases. The result was analysed using SPSS software. The p-value < 0.05 indicates a significant difference between two groups.

Results:

A total of 15 subjects were enrolled. Range of means for group A was 11.0 grams to 75.50 grams and standard deviation of ±22.5204. Range of means for group B was 19 grams to 97.25 grams and standard deviation of ± 27.0259.

Table 1: Retention of mandibular denture bases fabricated using conventional technique (Group A)

Patient No.	Reading 1 (in gms)	Reading 2 (in gms)	Reading 3 (in gms)	Mean (in gms)	S.D.±
1	70	78	76.2	75.5200	2.15213
2	35	37	34.8	42.8521	4.84205
3	40.4	47	44.8	46.5204	1.92501
4	11.5	11	12.8	12.0258	1.02587
5	22.7	23	23.8	23.6442	1.85221
6	60	62	61.2	61.0587	1.19452
7	44	45.8	46.5	46.3523	0.75201
8	25.1	22.5	19.5	20.2580	4.52081
9	70	72.2	73	72.0000	1.11355
10	25	22.4	21	22.5207	1.40475
11	34.2	36.5	35	34.2050	1.60000
12	40.8	52.5	44.2	45.2020	6.85492
13	50	51.5	55	50.2541	1.25851
14	74.5	75	72	70.5204	1.20512
15	13.4	14	15	14.0258	1.70981
Mean	37.0251				
Range	10.5-78.5				
S.D.	**±** 22.5204				
Range of Means	11.00-75.50				

Table 2: retention of mandibular denture bases fabricated using sublingual extension (Group B)

Patient No.	Reading 1 (in gms)	Reading 2 (in gms)	Reading 3 (in gms)	Mean (in gms)	S.D.±
1	93	91.5	93	92.4000	2.00528
2	62	64.52	57.20	61.2500	1.52033
3	71.05	72.60	69.42	72.2533	1.92180
4	20	20.05	21.84	20.5200	0.75278
5	41.50	44.51	44.20	42.5203	1.45216
6	76.2	74.25	76	75.5607	1.12510
7	70	68.45	73.5	70.5233	1.85204
8	38.42	40.54	44.25	41.0547	3.02542
9	92.50	94	91.51	92.3321	1.54204

10	35.42	39.42	38.04	37.4253	1.05882
11	46.20	44.20	48	46.2053	1.54529
12	48	55.20	59.24	57.2560	5.52011
13	64.21	66.21	74.02	67.2050	4.25046
14	96.45	96	99.10	97.2567	5.0289
15	20	23.02	19.52	21.5230	2.05628
Mean	57.2056				
Range	19– 96.05				
S.D.	± 27.0259				
Range of Means	19 – 97.25				

Discussion:

A specially designed apparatus consisting of a metallic stand and a digital force gauge was used to measure retention values. Patient was seated in an upright position as the muscles are in equilibrium of tonic contraction and patient was usually in this position for maximum time of the day while wearing dentures. [7]The chin of the patient was placed quite firmly in the chin rest. Nylon thread was used for attaching denture base to force gauze as it resist breaking under dislodging force, because of its strength. The patient was instructed to keep the tongue in a relaxed position with its tip lightly touching against the lingual surfaces of the lower anterior teeth. Force gauge attached to other end of the nylon thread was slowly pulled down in vertical direction until the denture base was dislodged and peak value was recorded (in grams) for both the denture bases. [2,8,9] Hence, this study was conducted to measure the changes in retention of mandibular denture with extension in sublingual region,and evaluate the impression method best suited for patients with mandibular ridge resorption. In the present study, a total of 15 subjects were enrolled. Range of means for group A was 11.0 grams to 75.50 grams and standard deviation of ±22.5204. A study by Bohnenkamp DM, Garcia LT (2007)5 reported the clinical use of phonetics & its effect on tongue position to improve the retention & stability of a mandibular complete denture. They concluded that patient education relative to phonetics, a favorable tongue position and their role in improving mandibular denture retention should be provided to patients as part of the clinical fabrication and insertion of complete dentures.[10] In the present study, range of means for group B was 19 grams to 97.25 grams and standard deviation of ± 27.0259. A study by Gafoor MAA, Kumar VVH, Sheejith M, Swapna C (2012) described a procedure to achieve retention in severely resorbed mandibular ridges during function by recording sublingual crescents in lower complete dentures & concluded that the procedure provided effective peripheral seal in the vulnerable anterior part of the alveololingual sulcus, resulting in excellent retention in ridges with normal or medium ridge height and satisfactory retention in severely resorbed ridges.[6]Denizoğlu S, Yanikoglu N, Yilmaz B, Kürklu D(2014)4 conducted a study on 32 patients to compare the effect of tongue movements on lingual sulcus depth, during the border molding process of impression making of mandibular complete dentures in which master impressions were made by allowing the patient to swallow and the other by enabling the tongue to make excessive movements, measurements were taken from different regions of the lingual sulcus by determining the length of the parallel lines drawn from fixed points marked on the residual ridge crest to the deepest point of the alveolingual sulcus and concluded that the swallowing in the vertical and horizontal directions provided higher values compared to the excessive movement of the tongue.[11]Primary impressions of the edentulous mandibular arches were made using impression compound, as it can be easily manipulated by heating to record all the limiting structures owing to its thermoplastic nature and high viscosity. It also has the advantage of flowing beyond the borders of the tray and compensate for underextensions of the tray. Moreover additions can be made to it if part of impression is deficient. [12]Sublingual extension was done using low fusing impression compound spanning the entire anterior lingual area, the added compound was premolded to approximate shape with fingers and placed in mouth. Patient was instructed to close and relax, placing the tongue in normal rest position with tip lightly touching the lingual side of tray handle. [6,13,14] Sublingual extension of the impression should have minimal pressure exerted on the floor of mouth with tongue at rest. This will allow movement of the underlying genioglossus muscle without dislodging the denture. [15]Craig RG, Berry GC, Peyton FA. (1960) reviewed the contribution of the forces of capillarity to

denture retention. The experimental retentive force measurements were made on a laboratory model composed of a plastic and a glass surface separated by a film of saliva. The retentive force for this system was calculated from an equation relating the retentive force to the surface tension of the saliva, the area of the film, the receding contact angle of saliva against plastic and the saliva film thickness. The retentive force values, calculated on the basis of capillarity, were in close agreement with experimentally determined retentive forces. These data indicate that capillary forces are the principal physical forces involved in denture retention.[16]

Conclusion:

There was a statistically significant increase in retention, mean vestibular depth and width of denture bases after border molding with sublingual extension as compared to denture bases with conventional border molding.

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