Eur. J. Prosthodont. Rest. Dent., Vol.8, No. 2, pp 63-66
Printed in Great Britain

The Effectiveness of Palate-Less Versus Complete Palatal Coverage Dentures (A Pilot Study)

Riyadh Akeel*, Mansour Assery† and Sheikha Al-Dalgan‡

Abstract - *The aim of this pilot study was to evaluate the effectiveness of palate-less dentures as a substitute for conventional complete palatal coverage. Ten edentulous patients who had recently received maxillary and mandibular complete dentures were included in the study. The patients' maxillary conventional dentures were duplicated to construct 'U' shape palate-less dentures. A strain gauge biting fork was used to compare the maximum biting force and chewing tests using almond were performed. They failed to show significant differences. Eight patients were more comfortable with the palate-less dentures than the complete palatal coverage. It was concluded that Palate-less dentures could be as effective as dentures with complete palatal coverage.*

KEY WORDS: Denture Design; Denture Retention; Masticatory Efficiency

INTRODUCTION

It is well known that the retention of a complete denture is influenced by several factors such as the size, shape and material of the denture base, the age and health of the patient, the character of the mucosa, denture experience and the quality of saliva[1].

Several investigators[1-5] have indicated that the retention of a maxillary complete denture is highly dependent on the posterior denture border and maximum palatal coverage. When the denture border is terminated on soft displaceable tissue, a border seal may be created and the resistance to displacing forces increased[2-3].

Maximum palatal coverage has been demonstrated to increase the denture bearing area, thus reducing the pressure on the residual ridges and improving the retention of the denture[2]. However, complete palatal coverage could result in gagging problems in addition to partial or complete loss of taste perception[6-11]. These effects might be attributed to pressure, pain or coverage of the taste buds,[6] and to a reduction in tactile sensation rather than to an alteration in gustatory reception and response[7]. Although not a routine prosthodontic therapy, the palate-less denture has been used effectively in treating patients with extreme gagging reflexes[12]. The latter study stated that optimal retention rather than maximum retention could be sufficient for proper functioning of the dentures.

Floystrand *et al.*[13] examined the retention of palate-less complete dentures reduced to a 'U' shape. No significant difference in retention was shown when compared to the dentures before the palatal reduction.

Satisfaction with masticatory efficiency is a prime concern of complete denture wearers. However, the self-assessment of masticatory ability is, in general, too optimistic when compared with results of functional tests, and hence could explain the acceptance of palate-less dentures by some patients[14]. No previous attempt has been made to objectively compare the masticatory efficiency of this therapy with conventional complete palatal coverage. The aim of this pilot study was to evaluate the effectiveness of palate-less dentures in terms of masticatory efficiency and biting force, compared to conventional complete palatal coverage dentures.

MATERIALS AND METHODS

Ten edentulous patients, five men and five women, with an age range of 36-76 years, were selected for this study. They were consecutive recall patients who had received maxillary and mandibular complete dentures at the College of Dentistry, King Saud University, three months to one year prior to this study. All the selected patients were healthy and with favourable residual ridge height. They were satisfied with the aesthetics and function of their dentures. However, nine patients complained about taste perception and one patient had a gagging problem. Clinical retention of the maxillary denture was checked by applying force on the incisors to displace the denture away from the tissues. Force was also applied toward the tissues over the occlusal surfaces of each side (i.e., right and left) alternatively to assess denture stability. All clinical examinations were made by one examiner and all dentures were found to be satisfactory.

Alginate moulds were made to duplicate the maxillary dentures. The duplication technique was described by Cooper and Watkinson[15] and Duthie *et al.*[16] and modified by Heath and Davenport[17]. Alginate impressions of the mandibular dentures were also made for occlusal articulation and the casts were poured in dental stone. Shades and moulds of the teeth for the new Palate-less dentures were selected to exactly resemble those of the previously constructed conventional dentures. Teeth were then arranged and the dentures were tried to assess

*BDS, MDS, Ph.D
†BDS, MPH, AACP
‡BDS, M.Sc.

aesthetics, phonetics, and occlusion. When a satisfactory trial procedure was attained, the trial dentures were used as trays to make impressions of the maxillary arches using light body silicon rubber impression material (President).

Impressions were then poured in dental stone, and the casts were beaded in a 'U' shaped pattern from the palatal side (*Figure 1*). The dentures were flasked, processed, finished and polished. Finally, the dentures were delivered to the patients. All conventional maxillary dentures were taken from patients to ensure the use of the new denture.

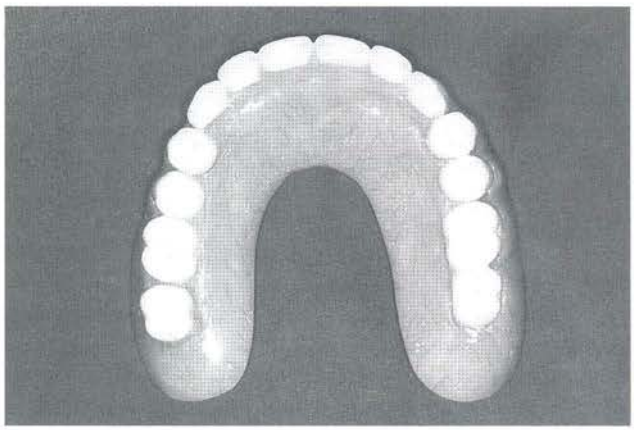

Figure 1. *The 'U' shape design of the palate-less denture*

Masticatory Efficiency Test

The method of Helkimo *et al.*[18], was used for the present study. It briefly consisted of having patients chew bleached almonds of a standard size for different durations. Each of the samples of chewed material was fractionated in a system of sieves. A masticatory efficiency index based on the size of the particles and the mastication time was established between one (very good masticatory efficiency) and five (very poor masticatory efficiency).

For the conventional dentures the test was performed before the duplication procedure. One month following the delivery of the palate-less dentures the patients were recalled for the second masticatory efficiency test.

Biting force measurement

Maximum biting force (MBF) was measured using a calibrated bite gauge constructed from strain gauges[19]. The biting plates were covered by plastic material to act as a cushion. The measurements were made in three regions by placing the bite gauge between incisors, right and left premolars. The subject was asked to bite with maximum force until dislodgement of the denture occurred three times in each region. The maximum reading from the three trials was recorded as a measure of retention and stability of the denture. The biting force was measured at the same appointment as the chewing efficiency test.

Subjective evaluation

The patients' evaluation of the palate-less denture was registered by asking the following question:

How comfortable are you with the new denture?

a) More comfortable than the previous denture.

b) Similar to the previous denture.

c) Worse than the previous denture.

Statistical methods

Differences in the masticatory efficiency index and maximum biting force between the two types of denture were statistically tested using the non-parametric Wilcoxon test.

RESULTS

Patients' self-evaluation revealed that eight patients thought that palate-less dentures were more comfortable than conventional dentures. One female patient indicated that the palate-less denture was as comfortable as the conventional denture, while another female patient who did not accept the palate-less denture returned to wearing her conventional denture.

Four patients had improved masticatory efficiency with the palate-less denture while six patients had a similar index. The mean masticatory efficiency score for the palate-less denture was lower (improved) but this difference failed to show a statistical significance (*Table 1*).

The mean maximum biting force was lower in the anterior region than posteriorly (*Table 2*). The two types of dentures failed to show a significant difference in all the biting regions. However, seven patients had a lower reading with the palate-less denture in the anterior region.

Table 1. *The masticatory efficiency index for each subject with both types of dentures* ***(The lower the index, the higher the masticatory efficiency)***

Subject	*Conventional*	*Palate-less*
1	2	2
2	1	1
3	5	5
4	4	1
5	2	2
6	3	1
7	2	1
8	3	3
9	4	3
10	3	3
Mean	2.9	2.2
SE	0.38	0.42
P. Wilcoxon	0.07 (NS)	

Table 2. *Maximum biting force in N for each type of denture in different biting regions*

	Anterior		*Left*		*Right*	
Subject	*Conventional*	*Palateless*	*Conventional*	*Palateless*	*Conventional*	*Palateless*
1	18	23	57	60	36	47
2	4	2	38	55	33	71
3	12	2	27	23	28	28
4	91	81	109	113	79	100
5	155	160	200	136	88	88
6	5	5	30	27	21	23
7	26	18	83	83	77	49
8	32	31	45	35	61	53
9	13	8	18	18	47	31
10	30	20	45	57	64	59
Mean	38.6	35.0	65.2	60.7	53.4	54.9
SE	15.2	15.7	17.3	12.5	7.5	8.0
P Wilcoxon	0.08 (NS)		1.0 (NS)		0.89 (NS)	

DISCUSSION

Maximum palatal coverage in completely edentulous patients is indicated for better retention[1-5]. Despite this fact, the results of the present study showed that eliminating the palatal part of the denture in a 'U'shape pattern did not negatively affect the retention, stability or masticatory efficiency. Most patients were satisfied with the new design and thought it more comfortable than dentures with complete palatal coverage. This could be explained by better taste and temperature perception, less weight and absence of gagging. These results are in agreement with those reported earlier[6-9].

Strain[6] and Shannon *et al.*[7], concluded that extending the denture base into the soft palate could lead to pressure, pain, actual coverage of the taste buds and a reduction in tactile sensation. As a consequence there would be a highly significant decrease in parotid flow rate[7].

Conversely, Laird[20] did not find any correlation between the palatal coverage and taste perception. Furthermore, Kapur *et al.*[21] showed that maximum palatal coverage slightly improved taste perception.

Masticatory efficiency test results were comparable to those of Helkimo *et al.*[18] in denture wearers using the same test method. It seems that eliminating the palatal coverage failed to reduce the masticatory efficiency of these patients. This corroborates similar results by Kapur *et al.*[22] where reduction in the extension of maxillary denture bases in different areas failed to affect the chewing ability of the subjects.

Contrary to what could be expected, some patients had a slight improvement in masticatory efficiency with the palate-less dentures though this failed to show statistical significance. These results could not be ascribed to the fact that the mere construction of a new denture will enhance the masticatory efficiency. In a previous study where the test food was fractionated in a sieve system, no improvement was found in masticatory efficiency after the transition from old to new dentures[23].

The mean maximum biting forces achieved in this study were comparable to those found in complete denture wearers using a similar measuring device[24,25]. No statistically significant difference could be shown between the two types of dentures. It was expected that the MBF of the palate-less denture would be reduced in the anterior region due to the absence of posterior palatal seal. Although most patients showed a reduced MBF in that region, it did not reach a significant level. These results were similar to the results of Floystrand *et al.*[13] on the dislodgement forces in that area, and might be associated with the favourable residual ridge height in this small group of patients. Previously palate-less dentures have been used as a temporary treatment for patients with a pronounced gagging reflex[12] or for oral lesions caused by ill-fitting dentures[26]. Farmer and Connelly[12] indicated the utmost importance of a very well balanced occlusion with this type of prosthesis.

Despite the small number of patients investigated, it is reasonable to conclude that palate-less dentures could be considered as effective as dentures with complete palatal coverage. However, investigation of a larger group of patients with a wider range of residual ridge forms is needed to confirm the results of this preliminary study.

There is also a need for longitudinal studies to evaluate the effect of this treatment on a long-term basis.

MANUFACTURER DETAILS

- President, Coltene, Whaledent Corp., New Jersey, USA

ADDRESS FOR CORRESPONDENCE

Dr. Riyadh Akeel, Dept. Of Prosthetic Dental Sciences, King Saud University. P.O. Box 60169 Riyadh 11545, Kingdom of Saudi Arabia. E-mail: RAKEEL@KSU.EDU.SA

REFERENCES

1. Avant, W.E. A comparison of the retention of complete denture bases having different types of posterior palatal seal. *J. Prosthet. Dent.* 1973; **29**: 484–493.
2. Silverman, S.I. Dimensions and displacement patterns of the posterior palatal seal. *J. Prosthet. Dent.* 1971; **25**: 470–488.
3. Loft, F. and Levin, B. Flange technique: An anatomic and physiologic approach to increase retention, function, comfort and appearance of dentures. *J. Prosthet. Dent.* 1966; **16**: 394–413.
4. Barbenel, J.C. Physical retention of complete dentures. *J. Prosthet. Dent.* 1971; **26**: 592–599.
5. Skinner, E.W. and Chung, P. The effect of surface contact in the retention of a denture. *J. Prosthet. Dent.* 1951; **1**: 229–235.
6. Strain, J.C. The influence of complete dentures upon taste perception. *J. Prosthet. Dent.* 1952; **2**: 60–67.
7. Shannon, I.L., Teny J.M. and Nakamoto, R.Y. Palatal coverage and parotid flow rate. *J. Prosthet. Dent.* 1970; **24**: 601–607.
8. Giddon, D.B., Dreisbach, M.E., Pfaffman, C. and Manley, R.S. Relative abilities of natural and artificial dentition patients for judging sweetness of solid foods. *J. Prosthet. Dent.* 1954; **4**: 263–268.
9. Martone, A.L. and Edwards, L.F. Phenomenon of function in complete denture prosthodontics. Part III: Functional anatomic considerations. *J. Prosthet. Dent.* 1962; **12:** 206–219.
10. Wright, S.M. Medical history, social habits, and individual experiences of patients who gag with dentures. *J. Prosthet. Dent.* 1981; **45**: 474–478.
11. Conny, D.J. and Tedesco, L.A. The gagging problem in prosthodontic treatment. I. Descriptions and causes. *J. Prosthet. Dent.* 1983; **49**: 601–606.
12. Farmer, J.B. and Connelly, M.E. Palate-less dentures: Help for the gagging patient. *J. Prosthet. Dent.* 1984; **52**: 691–694.
13. Floystrand, F., Karlsen, K., Saxegaard, E. and Orstavik, J.S. Effects on retention of reducing the palatal coverage of complete maxillary dentures. *Acta Odontol. Scand.* 1986; **44**: 77–83.
14. Carlsson, G.E. Masticatory efficiency: The effect of age, the loss of teeth and prosthetic rehabilitation. *Int Dent J.* 1984; **34**: 93–97.
15. Cooper, J.S. and Watkinson, A.C. Duplication of full dentures. *Br Dent. J.* 1976; **141**: 344–348.
16. Duthie, N., Lyon, F.F, Sturrock, R.C. and Yemm, R. A copying technique for replacement of complete dentures. *Br. Dent. J.* 1978; **144**: 248–252.
17. Heath, J.R. and Davenport, J.C. A modification of the copying denture technique. *Br. Dent. J.* 1982; **153:** 300–302.
18. Helkimo, E., Carlsson, G.E. and Helkimo, M. Chewing efficiency and state of dentition. *Acta Odontol. Scand.* 1978; **36**: 33–41.
19. Al Saad, M. Electromyographic and occlusal force evaluation in patients with temporomandibular disorders using two different occlusal devices. M.Sc., King Saud University, Riyadh, Saudi Arabia. 1998: 55–63.
20. Laird, D.A. Does denture wearing affect the sense of taste? *J. Am. Dent. Assoc.* 1939; **26**: 1518–1519.
21. Kapur, K.K., Collister, T and Fischer, E.E. Masticatory and gustatory salivary reflex secretion rates and taste threshold of denture wearers. *J. Prosthet. Dent.* 1967; **18**: 406–416.
22. Kapur, K.K., Soman, S. and Stone, K. The effect of denture factors on masticatory performance. Part I: Influence of denture base extension. *J. Prosthet. Dent.* 1965; **15**: 54–64.
23. Gunne, H-S. J., Bergman, B., Enbom, L. and Hogstrom, J. Masticatory efficiency of complete denture patients. A clinical examination of potential changes at the transition from old to new dentures. *Acta Odontol. Scand.* 1982; **40**: 289–297.
24. Helkimo, E., Carlsson, G.E. and Helkimo, M. Bite force and state of dentition. *Acta Odontol. Scand.* 1977; **35**: 297–303.
25. Atkinson, H.F. and Ralph, W.J. Tooth loss and biting force in man. *J. Dent. Res.* 1973; **52**: 225–228.
26. Bodine, R.L. Oral lesions caused by ill-fitting dentures. *J. Prosthet. Dent.* 1969; **21**: 580–388.