Adhesive-Mediated Enhancement of Occlusal Force Measurements in Patients with Existing and New Complete Dentures: A Pilot Study

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A disposable gnathometer was used to compare measurements of incisal and premolar occlusal forces in removable prosthesis–wearing patients with and without the use of a denture adhesive. Twenty-four patients with maxillary complete dentures opposed by complete or partial mandibular dentures were tested. Denture adhesive significantly improved incisal and premolar occlusal force for the maxillary complete dentures, as well as incisal occlusal force for both existing and new dentures. The occlusal force in patients with mandibular removable partial dentures exceeded that with mandibular complete dentures. Denture adhesive appears to be beneficial for both existing and new dentures, with existing dentures exhibiting an increased benefit relative to newer dentures. *Int J Prosthodont 2010;23:155–157.*

Most reports on assessing occlusal force in denture wearers concentrate on the effect of adhesive on the incisal occlusal force.[1–3] Consequently, less is known about how adhesives affect the forces of posterior teeth. The present preliminary study used a modified disposable gnathometer to measure incisor and premolar occlusal forces in patients with maxillary complete dentures. Occlusal force differences before and after use of a denture adhesive in existing and new dentures were compared for two groups: patients with both maxillary and mandibular complete dentures and patients with maxillary complete dentures and mandibular removable partial dentures.

Materials and Methods

This pilot study recruited 24 participants (6 men, 18 women). The inclusion and exclusion criteria used for patient selection were as follows: no physical or mental disability that would interfere with the study, no excessive discomfort while biting on a gnathometer, and a Class I maxillary and mandibular relationship with denture-bearing tissues that were rated as satisfactory to good. Individuals with a deep palatal vault, torus palatinus, excessive flabby tissue, or gross bony protuberances in the lateral tuberosity region were excluded. Existing dentures needed to have an adequate border extension and posterior palatal seal.

All patients had worn complete maxillary dentures for an average of 15.4 years, with 12 patients (mean age: 75.1 years) having dentures opposed by mandibular removable complete dentures (mean period of use: 8.9 years) and 12 patients (mean age: 68.1 years) with mandibular removable partial dentures (mean period of use: 6.7 years; mean no. of natural teeth: 4.5 ± 3.03). All patients with mandibular removable partial dentures were Kennedy Class I and had wrought-wire circumferential retentive clasp arms or bar clasp retentive arms located at the most distal abutment. All participants were seeking treatment with new dentures.

Data were obtained from the incisor and right and left premolar regions via a disposable gnathometer (Fig 1). Occlusal forces were measured with incisor teeth in an edge-to-edge position or with patients biting unilaterally (premolars). The gnathometer was inserted between the teeth to be tested and each participant was instructed to close the mouth slowly and evenly until the maxillary denture dislodged. After a 2-minute rest interval, the procedure was repeated and the mean value of the two readings recorded.

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Fig 1 The modified disposable gnathometer with 18 scales to measure occlusal force values.

Table 1 Results (kg ± SD) for Patients with Complete Maxillary and Mandibular Dentures (n = 12)

	Existing dentures		New dentures		
Denture region	Without adhesive[1]	With adhesive (% improvement)[2]	Without adhesive[3]	With adhesive (% improvement)[4]	Multiple comparison*
Incisal	2.42 ± 1.00	4.11 ± 1.26 (70%)	4.60 ± 1.63	6.39 ± 2.13 (39%)	2, 3, 4 > 1; 4 > 2, 3
Right premolar	3.98 ± 1.62	6.88 ± 2.68 (73%)	8.12 ± 3.08	10.31 ± 3.39 (27%)	2, 3, 4 > 1; 4 > 2, 3
Left premolar	3.92 ± 1.49	6.82 ± 2.32 (74%)	7.74 ± 2.18	9.85 ± 3.73 (27%)	2, 3, 4 > 1; 4 > 2, 3

SD = standard deviation.
*P = .05.

Table 2 Results (kg ± SD) for Patients with Complete Maxillary Dentures and Removable Partial Mandibular Dentures (n = 12)

	Existing dentures		New dentures		
Denture region	Without adhesive[1]	With adhesive (% improvement)[2]	Without adhesive[3]	With adhesive (% improvement)[4]	Multiple comparison*
Incisal	2.93 ± 1.79	4.66 ± 2.13 (59%)	5.43 ± 2.29	7.07 ± 3.21 (30%)	2, 3, 4 > 1; 4 > 2, 3
Right premolar	4.93 ± 2.50	7.98 ± 3.62 (62%)	9.76 ± 3.39	12.41 ± 3.79 (27%)	2, 3, 4 > 1; 4 > 2, 3
Left premolar	4.72 ± 1.88	7.36 ± 2.58 (56%)	9.17 ± 3.65	12.32 ± 3.58 (34%)	2, 3, 4 > 1; 4 > 2, 3

SD = standard deviation.
*P < .05.

Next, denture adhesive (Polident, GlaxoSmithKline) was dispensed into a 3-mL sterile plastic syringe, the denture was air dried, and 0.3 to 0.5 mL of adhesive was applied to the deepest area of both dentures and the posterior border of the maxillary denture. Fifteen minutes after reinsertion, gnathometer testing was repeated. The mean values (scales) of the two measurements at each region were converted from the gnathometer scale values to kg.

Statistical analysis was performed using a mixed model considering repeated measures. Multiple comparisons between groups were adjusted using the Bonferroni method (SAS version 9.0, SAS) with a significance level of .05.

Results

Tables 1 and 2 show that preadhesive occlusal forces for either existing or new dentures were greater for premolars than for incisors, and greater for patients with complete dentures opposing partial dentures than those opposing complete dentures. Occlusal force after adhesive application showed a statistically significant increase over preadhesive values for both incisors and premolars and for patients with either type of mandibular denture. The occlusal force attained with existing dentures after adhesive application was less than the occlusal force attained with new dentures before adhesive application in the same patient.

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The mean occlusal force values of removable partial dentures were higher than occlusal force values of complete dentures regardless of whether the dentures were existing or new, whether or not adhesive was used, and regardless of the measurement area selected.

Discussion

It is readily conceded that the clinical relevance of measuring the improved efficacy of dentures in a functional context is not addressed in this preliminary study. Nor is the impact of adhesive use on patients' perceptions of their dentures' performance. These observations merely confirm the conclusions of previous reports that in general, use of a denture adhesive improves incisal and premolar occlusal force in both existing and new dentures.[1–5] However, it must also be emphasized that occlusal forces measured at an increased occlusal vertical dimension are not comparable to studies in which maximum intercuspation was used.

It also appeared that reasonable occlusal forces were achieved for new dentures even without adhesive use. Therefore, theoretically, new dentures should not require an adhesive. Nonetheless, the application of an adhesive to new dentures further improved occlusal force in the testing situation used in this pilot study.

Conclusion

Denture adhesive is beneficial for both existing and new dentures. However, existing dentures exhibited an increased benefit compared to newer dentures.

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Literature Abstract

Correlation between gingival phenotype and Schneiderian membrane thickness

This study analyzed the possible association between gingival phenotypes and the thickness of the sinus mucosa. Twenty patients without any preoperative signs of maxillary sinus pathologies were included. During surgical intervention, maxillary mucosal biopsy specimens were obtained from the sinus floor and gingival thickness was measured at the maxillary anterior teeth. Eleven patients had thick gingival tissues and 9 had a thin gingival phenotype. Average thickness of the sinus membrane was 0.97 ± 0.36 mm. Thickness of the sinus mucosa amounted to 1.26 ± 0.14 mm in individuals with thick gingiva and 0.61 ± 0.15 mm in subjects with thin gingival tissues. The association between thickness of the antral mucosa and periodontal phenotypes was statistically significant. According to this study, gingival thickness seems to predict sinus membrane thickness. This prediction of the antral membrane thickness may be of practical importance during maxillary sinus augmentation procedures.

Aimetti M, Massei G, Morra M, Cardesi E, Romano F. *Int J Oral Maxillofac Implants* 2008;23:1128–1132. **References:** 30. **Reprints:** Dr Mario Aimetti, Corso Marconi, 13 10125, Torino, Italy. Fax: +390116682286. Email: mario.aimetti@ unito.it—*Majd Al Mardini, Hamilton, Ontario, Canada*

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