Short Communication

Influences on Clinical Wear of Acrylic Denture Teeth: A Pilot Study

Brigitte Ohlmann, Dr Med Dent[a]/Katrin Rohstock[b]/Judith Kugler[b]/Herbert Gilde, Prof Dr Rer Nat[c]/Jens Dreyhaupt, Dr Rer Nat[d]/Thomas Stober, Dr Med Dent[a]

This study aimed to evaluate the effect of gender, antagonistic teeth, and type of denture on clinical wear of denture teeth. Wear measurements were made on gypsum replicas of 204 posterior denture teeth after 6 months using an optical 3-dimensional profilometer. Data were analyzed using univariate and mixed regression procedures. The mean wear of all denture teeth was –20.5 µm (± 14.6). Males demonstrated significantly higher wear than females. Interactions of the variables "gender" and "type of denture" and "antagonist material" and "type of denture" also showed significant influences on wear. The results indicate that some clinical parameters may affect wear of denture teeth. *Int J Prosthodont 2007;20:496–498.*

It is difficult to predict clinical wear behavior of denture teeth because wear phenomena occurring in the oral cavity result from a complex interaction between different wear mechanisms and various factors (eg, gender or opposing teeth), which cannot be adequately simulated by in vitro tests.[1] The purpose of this prospective study was to evaluate the effect of gender, opposing teeth, and type of denture on clinical wear of denture teeth.

Materials and Methods

Thirty patients comprising 16 females (mean age: 59 years) and 14 males (mean age: 64 years) were provided with telescopic crown–retained removable partial dentures (RPDs), overdentures (ODs), and complete dentures (CDs). Exclusion criteria included being under the age of 18 or incapable of signing the informed consent form, bruxism, or known allergic reactions to the materials used. Altogether, 204 posterior denture teeth made of polymethyl methacrylate with inorganic fillers (Vitapan, Vita Zahnfabrik) were investigated in the study.

Immediately after insertion of the dentures and again after 6 months, polysiloxane impressions (Flextime, Heraeus Kulzer) were taken and super-hard stone die replicas were made (Fujirock Pearl white, GC Europe). Scanning of the surfaces of the baseline and follow-up replicas was performed with an optical 3-dimensional (3D) surface profilometer (Laserscan 3D, Willytec). Mean total vertical wear was determined with the aid of the surface analysis programs Scan 3D version 1.6 (scan parameters: number of steps 400; step distance 30 µm) and Match 3D version 2.3 (match parameters: iterations 5,800; minimal points 800) (Willytec).

Statistical analysis was performed using univariate and mixed effects regression models, including the patient as a random effect (SAS versions 8.2 and 9.1, SAS Institute).

Results

Fifty-nine denture teeth were excluded from further analysis because of adjustments or waste impression or because the patient failed to keep the appointment. Thus, 58 denture teeth were assigned to the CD group, 69 to the RPD group, and 18 to the OD group.

After 6 months, RPD teeth exhibited a mean total vertical wear of –22.8 µm (± 14.9, median: –18.6 µm), CD

[a]*Assistant Professor, Department of Prosthodontics, University of Heidelberg, Germany.*
[b]*Student, Department of Prosthodontics, University of Heidelberg, Germany.*
[c]*Material Scientist, Department of Prosthodontics, University of Heidelberg, Germany.*
[d]*Mathematician, Department of Medical Biometrics and Department of Information Science, University of Heidelberg, Germany.*

Correspondence to: *Dr Brigitte Ohlmann, Department of Prosthodontics, University of Heidelberg, Im Neuenheimer Feld 400, 69120 Heidelberg, Germany. Fax: 0049 6221 561775. E-mail: Brigitte_Ohlmann@med.uni-heidelberg.de*

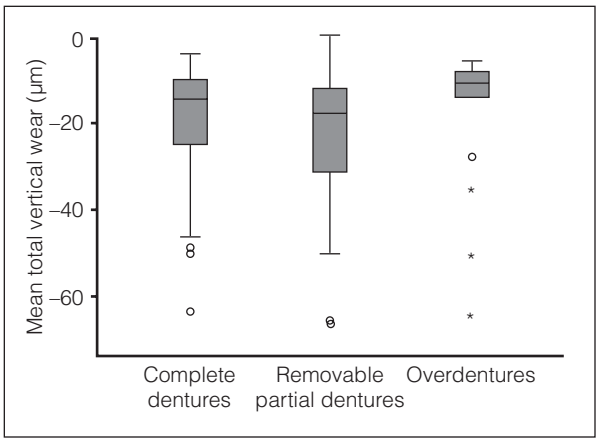

Fig 1 Effect of denture type on the mean total vertical wear of acrylic denture teeth. The box represents the 25th and 75th percentiles. Whiskers are drawn to 1.5× interquartile range beyond the 25th and 75th percentiles. Values outside 1.5 or 3 widths of the box are marked as outliers (o) or extremes (x), respectively. The bar represents the median.

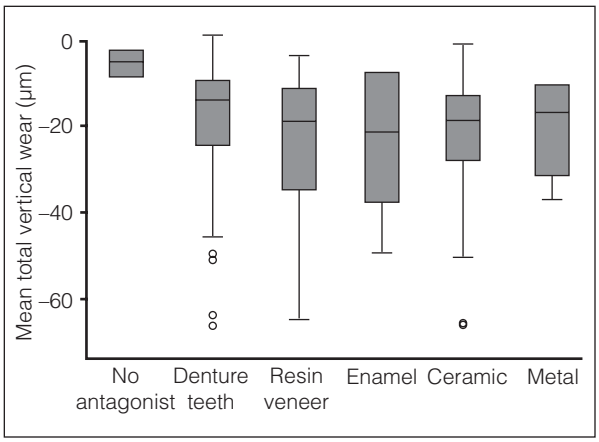

Fig 2 Effect of antagonistic material on the mean total vertical wear of acrylic denture teeth. The box represents the 25th and 75th percentiles. Whiskers are drawn to 1.5× interquartile range beyond the 25th and 75th percentiles. Values outside 1.5 or 3 widths of the box are marked as outliers (o) or extremes (x), respectively. The bar represents the median.

Table 1 Univariate Analysis for Interdependency of 2 Variables (Including Patient as an Influencing Factor)

Variables*	*P*
Denture type and gender	< .01
Denture type and antagonistic support	.46
Denture type and antagonistic material	.01
Denture type and shimstock contact	.80
Gender and antagonistic support	.70
Gender and antagonistic material	.29
Gender and shimstock contact	.64
Antagonistic support and antagonistic material	.43
Antagonistic support and shimstock contact	.52
Shimstock contact and antagonistic material	.90

*Denture type = removable partial denture, overdenture, or complete denture; antagonistic material = no antagonist, denture teeth, resin veneer, metal, enamel, or ceramic; antagonistic support = implant, fixed partial denture, removable partial denture, or complete denture; shimstock contact = static contact (yes or no, evaluated by 8-µm Hanel-Shimstock paper, Coltène/Whaledent).

Table 2 Final Mixed Regression Model (Including Patient as an Influencing Factor)

Variable(s)*	F	*P*
Denture type	1.90	.154
Gender	10.51	.002
Antagonistic support	1.86	.16
Antagonistic material	1.87	.12
Shimstock contact	0.93	.337
Denture type and gender	3.99	.048
Denture type and antagonistic material	3.11	.003

*Denture type = removable partial denture, overdenture, or complete denture; antagonistic material = no antagonist, denture teeth, resin veneer, metal, enamel, or ceramic; antagonistic support = implant, fixed partial denture, removable partial denture, or complete denture; shimstock contact = static contact (yes or no, evaluated by 8-µm Hanel-Shimstock paper, Coltène/Whaledent).

teeth exhibited a mean total vertical wear of –18.9 µm (± 13.2, median: –14.6 µm), and OD teeth exhibited a mean total vertical wear of –17.4 µm (± 16.7, median: –10.6 µm) (Fig 1). With regard to the antagonistic material, the mean total vertical wear ranged from –5.4 µm (± 4.3, median: –5.4 µm) for denture teeth with no antagonist to –24.1 µm (± 16.7, median: –21.3 µm) for denture teeth opposed by a natural tooth (Fig 2). Males demonstrated a significant higher mean total vertical wear (–22.5 µm ± 15.8, median: –16.2 µm) than females (–18.7 µm ± 13.1, median: –14.5 µm) ($P = .002$).

The interaction of the variables "type of denture" and "gender" and the combination of variables "type of denture" and "antagonistic material" showed a significant influence on wear ($P \leq .01$) (Tables 1 and 2).

Discussion and Conclusions

It has been suggested that clinical wear may be influenced by chewing efficiency or occlusal forces.[2] Starting from this point, one would expect a correlation between gender and clinical wear, because the results of Miyaura et al[3] showed higher occlusal forces in male subjects than in female subjects, which is in agreement with the results of the present study. Furthermore, the analysis of the interaction of the variables "gender" and "type of denture" showed significant influences on mean total vertical wear, indicating a statistically significant effect of the single variables alone. An explanation for the different wear behavior of denture teeth in RPDs and CDs may be the lack of

periodontal receptors for CD wearers; according to Trulsson and Gunne,[4] subjects lacking periodontal receptors show lower occlusal force. Moreover, patients with CDs may prefer softer food than RPD wearers.[3]

Although no significant differences were found between the single variables "antagonistic material" and "type of denture," the interaction of these variables showed significant influences on wear in this study. The higher mean vertical wear for denture teeth opposing natural teeth in this study is in accordance with previous studies.[5]

However, longer and more extensive clinical research is needed to confirm these results and allow for valid predictions regarding the clinical influences on wear behavior of denture teeth.

References

1. Yip KH, Smales RJ and Kaidonis JA. Differential wear of teeth and restorative materials: Clinical implications. Int J Prosthodont 2004;17:350–356.
2. Ogle RE, Davis EL. Clinical wear study of three commercially available artificial tooth materials: Thirty-six month results. J Prosthet Dent 1998;79:145–151.
3. Miyaura K, Morita M, Matsuka Y, Yamashita A, Watanabe T. Rehabilitation of biting abilities in patients with different types of dental prostheses. J Oral Rehabil 2000;27:1073–1076.
4. Trulsson M, Gunne HS. Food-holding and -biting behavior in human subjects lacking periodontal receptors. J Dent Res 1998;77:574–582.
5. Goehring TB, Schmidlin PR. Attritional wear and abrasive surface alterations of composite resin materials in vitro. J Dent 2002;30:119–127.

Literature Abstract

Match-pair analysis of survival of never smokers and ever smokers with squamous cell carcinoma of the head and neck

The purpose of this prospective epidemiologic study was to compare the survival rates between patients diagnosed with squamous cell carcinoma of the head and neck (SCCHN) with a current or previous history of smoking (ever smokers) and without a history of smoking (never smokers). More than 500 newly diagnosed patients previously untreated with SCCHN were recruited from 1995 to 2001. Eighty-three patients were identified as nonsmokers and were then matched to ever smokers. Never smokers were defined as those who had smoked fewer than 100 cigarettes in their lifetime. The following variables were used for the match criteria: age (+10 years), sex, site of primary tumor, stage of disease, nodal status (positive or negative), and treatment received (surgery; radiation therapy; surgery and radiation therapy; chemotherapy and radiation therapy; or chemotherapy, radiation therapy, and surgery). A total of 50 pairs of never smokers and ever smokers were matched. Survival between the 2 groups was compared using Kaplan-Meier estimates and the log rank test for equality of survival curves. Matched survival analysis was completed using Cox proportional hazards model. Analysis was from the time of first appointment with death and recurrence as censoring variables. Death was categorized into overall death or death owing to disease. The never smokers had a greater disease-specific survival rate ($P = .022$), overall survival ($P = .02$), and recurrence-free survival ($P = .016$). The match-pair analysis demonstrated that smoking was associated with a statistically significant increase in risk of death owing to disease (RR = 3.98), risk of overall death (RR = 3.5), and risk of disease recurrence (33 = 3.29).

Pytynia KB, Grant JR, Etzel CJ, Roberts DB, Wei Q, Sturgis EM. *J Clin Oncol* 2004;22:3981–3988. **References:** 32. **Reprints:** Dr Erich M. Sturgis, Department of Head and Neck Surgery, Unit 441, University of Texas MD Anderson Cancer Center, 1515 Holcombe Blvd, Houston, TX 77030-4009. E-mail: esturgis@mdanderson.org—*Alvin G. Wee, OSU College of Dentistry, Columbus, O*