The Impact of Tooth Loss on General Health Related to Quality of Life Among Elderly Pomeranians: Results from the Study of Health in Pomerania (SHIP-0)

Florian Mack, Dr Med Dent^a/Christian Schwahn, Dr Rer Nat^b/Jocelyne S. Feine, DDS, HDR^c/ Torsten Mundt, Dr Med Dent^a/Olaf Bernhardt, PD, Dr Med Dent^d/Ulrich John, Prof Dr Phil^e/ Thomas Kocher, Prof Dr Med Dent^f/Reiner Biffar, Prof Dr Med Dent^g

Purpose: It is important to know whether tooth loss has an impact on an individual's quality of life, since tooth loss is common. The aim of this study was to determine whether oral status is associated with general health and related to quality of life. **Materials and Methods:** Data of 1,406 subjects aged 60 to 79 years were taken from the Study of Health in Pomerania (SHIP). Sociodemographic (age, sex, and education level) and medical information (including the most common diseases in Germany) were gathered through an interview, and income data were obtained from a self-administered questionnaire. The prosthetic status in the maxilla and mandible was classified into complete denture or removable partial denture or with \geq 10 natural teeth including fixed prosthodontics (\leq 9T). The health-related quality of life was measured using the Short Form (SF-12) questionnaire. Multiple linear logistic regression analyses were used to identify the nonstandardized beta coefficient using physical and psychologic indices from the SF-12 as dependent variables and sociodemographic information, prosthetic status, and disease state as independent variables.

Results: Prosthetic status is related to the physical scale of the SF-12. Additionally, we found that \leq 9T had a significant effect on the physical index of general health-related quality of life. **Conclusion:** Reduced dentition without replacement of missing teeth by removable or fixed prosthodontics reduces the physical index of quality of life to the same extent as cancer or renal diseases. *Int J Prosthodont 2005;18:414–419.*

Extension of people's life span and enhancement of their quality of life (QOL) are the main goals in medicine.^{1,2} Since dental care for the elderly is becoming prevalent, it is important to know whether tooth loss, general health, and dental treatment have an impact on the individual's QOL. Little is known about the relationships between general health, oral health, and health-related QOL. Recently, it has become clear that oral health in older people is an integral part of general health that contributes to, and is influenced by, health-related QOL at the biologic, psychologic, and social levels.3-6 Increasingly, QOL assessment is regarded as an essential component for assessing health care outcomes, including outcomes for public health programs.⁷ Since general health is related to oral health and general health is related to QOL, tooth loss could have an impact on quality of life.

^aAssistant Professor, Center of Oral Health, University of Greifswald, Policlinics of Prosthetic Dentistry, Gerodontology and Biomaterials, Greifswald, Germany.

^bAssistant Professor, Center of Oral Health, University of Greifswald, Greifswald, Germany.

[°]Professor, Faculty of Dentistry, McGill University, Montreal, Canada.

^dAssistant Professor, Center of Oral Health, Department of Restorative Dentistry, Pediatric Dentistry and Periodontology, University of Greifswald, Greifswald, Germany.

^eProfessor and Head, Institute of Epidemiology and Social Medicine, University of Greifswald, Greifswald, Germany.

^fProfessor, Center of Oral Health, Department of Periodontology, University of Greifswald, Greifswald, Germany.

⁹Professor and Head, Center of Oral Health, University of Greifswald, Policlinics of Prosthetic Dentistry, Gerodontology and Biomaterials, Greifswald, Germany.

Correspondence to: Dr Florian Mack, Center of Oral Health, University of Greifswald, Policlinics of Prosthetic Dentistry, Gerodontology and Biomaterials, Rotgerberstr. 8, D-17487 Greifswald, Germany. Fax:+49-3834-867148. E-mail: mack@uni-greifswald.de

QOL is difficult to define because it is a subjective, dynamic concept based on an individual's internal frame of reference, understanding, or perceived life experience.⁸ The current existence and utilization of a range of instruments that employ different dimensions and scales to measure QOL for the elderly demonstrates that there is a lack of consensus about its definition and measurement methodology.⁹

In 1995, Wilson and Cleary demonstrated that any organic dysfunction initiates a chain of negative factors on general health.¹⁰ General health is guided by functional status and by social and emotional factors. Therefore, QOL is a product of reported medical factors as well as nonmedical factors. Validated and known instruments to describe (general) health-related QOL are the Sickness Impact Profile¹¹ and the Short Form 36 (SF-36).¹²

The SF-36 measures the impact of general health conditions on QOL. It is considered a reliable instrument recommended for use with disease-specific scales to measure the effects of disease on QOL.¹³ Evaluation of the SF-36 provides results that are not related to oral health.¹⁴ Hence, use of the SF-36 to quantify oral health-related QOL is controversial. For instance, Allen et al found no differences between patients having troubles with complete dentures versus an implant supported denture when using the SF-36.⁶ However, other studies found differences when using the Oral Health Impact Profile (OHIP-49), a validated oral health-related QOL questionnaire.¹⁵⁻¹⁷

To our knowledge there is one published study about QOL and the ranking of dental or prosthetic status in relation to general health in an elderly population; it focused on the QOL of patients treated with implant-supported dentures.¹⁵ The aim of this study is to determine whether oral state is associated with general health related to QOL. The specific hypotheses are: First, prosthetic status is not related to QOL (hypothesis 1); second, prosthetic status has no greater impact on QOL than do all other diseases (hypothesis 2).

Materials and Methods

Data Collection

A total of 6,248 subjects aged 20 to 79 years were invited to participate in the Study of Health in Pomerania (SHIP). The sample had been randomly drawn after stratification by age and gender from official inhabitant lists that are representative of the population.^{18,19} The study was undertaken from 1997 to 2001. Overall, 69% (4,310) gave their consent and were examined. For the purpose of this study, the data of 1,406 subjects aged 60 to 79 years who agreed to participate were reviewed. The medical and dental examinations took place in 2 similarly equipped medical/dental facilities in the cities of Greifswald and Stralsund, Germany. On average, each subject required 4 hours to complete all parts of the SHIP, including the medical and dental examinations, questionnaires, and interviews.^{18,19}

The dental component of SHIP contained 1,217 variables, including a structured interview. The examinations were performed by 5 clinicians (alternating daily) from the dental school of the University of Greifswald. In SHIP, all field staff followed a quality control program mandated for the entire data collection period. The examiners used a standard examination environment, standard equipment, and detailed written instructions. All examiners received formal training in assessing required measures and indices, both before data collection and twice a year during data collection. Dental experts in oral measures and indices served as standards for training the field examination teams. The protocol was designed to reduce systematic and random measurement errors.¹⁹

Classification of Subjects

Sociodemographic information (age, sex, and educational level) and general health of the subjects were gathered from the medical portion of the SHIP health questionnaire. The educational level of participants was classified into 3 categories: low, middle, and high. Completion of elementary school or a lack of formal professional education was considered "low"; completion of secondary school or technical college was considered "middle"; and holding a bachelor degree or any university degree was considered "high." The data regarding monthly household income were classified into 22 groups, from less than 400 German marks (about 200 euros) to 15,000 and greater German marks (about 7,500 euros).

The following diseases were found to be the most frequent in Germany²⁰: allergies, cancer, chronic bronchitis, diabetes, gastrointestinal diseases, cardiovascular disease (ie, heart attack experienced by patient), hypertension, osteoporosis, renal diseases, rheumatism, and cardiovascular disease (ie, stroke experienced by patient).

The marker used to identify diabetes was hemoglobin A_{1C} (Hb A_{1C}), which was measured by blood analyses.²¹ Subjects with a Hb A_{1C} of \geq 7% were considered to be diabetic.

The prosthetic status of each subject was classified into 1 of 4 groups in the mandible and maxilla, based on masticatory function.²² Group CD comprised subjects who had a complete denture. Group RPD comprised subjects that had a removable partial denture. Group \ge 10T consisted of subjects with no removable denture and 10 or more natural teeth, with or without fixed prosthodontics. Group \le 9T consisted of subjects with no removable denture and less than 10 natural teeth, with or without fixed prosthodontics. Subjects in group \ge 10T or \le 9T had, on average, less than 1 pontic in each jaw, so this was considered as a natural tooth.

Health-related QOL was measured using the validated German version of the SF-12, a short form of the SF-36.²³ The SF-12 measures 2 indices with data from a German norm population: the Physical Index and the Psychologic Index.²³

Statistical Analyses

For the purpose of our analyses, the estimated household income was computed to be the midpoint between the interval limits of the income class to which the subject belonged. The estimated income followed a normal distribution according to a P-P plot and was presented in quartiles. Educational levels and the prevalence of disease were computed as percentages.

To determine the significance level of the physical and psychologic scales related to any disease, the nonparametric Kruskal-Wallis test was used. Hypothesis 1 was tested by the Mann-Whitney test to determine whether the physical and/or psychologic state were related to prosthetic status. Hypothesis 2 was tested using a linear logistic regression analysis.

As dependent variables, the physical and psychologic indices of the SF-12 were measured separately. The independent continuous variables were age, income, and educational level. The independent dichotomous variables were classified as prosthetic status, disease state, and gender. All results were checked for colinearity. Linear logistic regression analyses were used to identify the nonstandardized β coefficient using the stepwise backward method with a cut-off point of 0.15 for removal and 0.10 for re-entering the variable.²⁴ The level of significance was set at *P* < .05.

Results

Among the 1,406 subjects (aged 60 to 79 years) who participated in the study, 54% (n = 760) were men and 46% (n = 646) were women. Seventy-seven percent had a "low" educational level, 15% were "middle," and 9% had a "high" educational level. A total of 1,285 (91%) subjects answered the question related to income, out of which a median of 25% reported an income lower than 1,875 euros, 50% lower than 2,675 euros, 75% lower than 3,250 euros, and 5% more than 4,250 euros.

Table 1	Frequencies (%) of Disease and Prosthetic	
Status Ar	ong Subjects 60 to 79 Years of Age, by Gende	er

	Men	Women	Р
Allergy	55.1	63.3	NS
Cancer	4.4	1.4	.001
Chronic bronchitis	10.5	8.3	NS
Diabetes	9.7	11.1	NS
Gastrointestinal diseases	9.4	11.5	NS
Heart attack	12.5	3.4	<.001
Hypertension	54.2	58.0	NS
Osteoporosis	48.6	63.1	<.001
Renal diseases	28.5	14.3	<.001
Rheumatism	37.2	53.1	<.001
Stroke	7.9	3.4	<.001
Vertebral degeneration	47.6	51.4	.001
Dental factors			
Maxilla ≥ 10 teeth	19.8	19.4	NS
Maxilla RPD	27.2	26.1	NS
Maxilla CD	49.0	50.8	NS
Maxilla ≤ 9 teeth	4.0	3.8	NS
Mandible ≥ 10 teeth	29.4	25.2	<.05
Mandible RPD	31.6	34.7	NS
Mandible CD	31.2	32.8	NS
Mandible ≤ 9 teeth	7.8	7.3	NS

NS = not significant (P > .05). RPD = removable partial denture; CD = compete denture.

Table 2	Relationship of Prosthetic Status (%) in
Maxilla an	d Mandible

	Maxilla				
Mandible	≤ 9T	CD	RPD	≥ 10T	
≤ 9T	1	2	3	1	
CD	< 1	30	2	< 1	
RPD	<1	15	15	2	
≥ 10T	2	2	7	17	

 \leq 9T = having 9 teeth or less; CD = having a complete denture; RPD = having a removable partial denture; \geq 10T = having 10 or more teeth.

Allergy (men 55% and women 63%), osteoporosis (men 49% and women 63%), and hypertension (men 54% and women 58%) were the diseases from which the largest numbers of subjects suffered (Table 1).

A total of 30% of subjects had CDs in both jaws, followed by 17% with \ge 10T in both jaws (17%) and 15% with RPDs in both jaws or a RPD in the mandible and a CD in the maxilla (Table 2).

Nonparametric significance tests between diseases and, contrary to other selected diseases, the SF-12 Physical Index showed that cancer was not significantly related to lower scores (P > .05). There was no significant association between the Psychologic Index and stroke, cancer, heart attack, and renal diseases.

For hypothesis 1, a significant association between prosthetic status and the physical scale of the SF-12 (P < .05) was found, but no significant association was found between prosthetic status and the Psychologic Index (P > .05).

Table 3Example of a Final Linear Regression AnalysisUsing Physical Index as the Dependent Variable andStroke for Disease as an Independent Variable

	β*	β	Р	Colinearity factor
Intercept	52.69		<.000	
Age	-0.17	-0.31	<.000	1.33
Income	0.28	0.05	.001	1.16
Educational level high	1.45	0.11	<.000	1.48
Gender	1.21	0.07	<.000	1.02
≤ 9 teeth in maxilla	-2.25	-0.45	.002	1.02
Stroke	-3.98	-0.07	<.000	1.03

Nagel-Kerke $R^2 = 0.17$.

 β^* = nonstandardized regression coefficient; β = standardized regression coefficient.

Positive values indicate an increase in QOL, whereas negative values indicate a decrease in QOL.

Data analyses for hypothesis 2 revealed that prosthetic status had no significant effect, independent of any disease, on the psychologic index QOL. However, age, income, high educational level, gender, disease state, and always having ≤ 9T in the maxilla were significantly associated with the Physical Index. The regression analysis with stroke as an independent variable for a disease is presented in Table 3 to serve as an example of regression analyses for all diseases. The intercept of the nonstandardized β coefficient shows the mean value of QOL over the total sample. Positive values for other independent variables indicate an increase in QOL, whereas variables with negative values indicate a decrease in QOL. All linear regression analyses for each given disease are shown in Fig 1. Due to the presence of \leq 9T in the maxilla in all final models, the nonstandardized ß coefficient was reported as a mean. Osteoporosis was associated with the worst increase in the physical index in QOL. The impact of having \leq 9T fell between the impact of renal disease and cancer.

Discussion

The survey sample used in this study was representative of the population within the study region of Pomerania.^{18,19} The population of Pomerania is largely Caucasian, lives in rural areas, and has a historical background that predates the reunification of East and West Germany. Because older populations are known to have a decreased QOL⁴ and frequently suffer from multimorbidity, with changes in their dental status,²² they were selected for this study. The use of well-defined clinical criteria and the repeated calibration of the examiners proved effective, with minimal variability, as illustrated by the Kappa values and interexaminer correlation.²¹ The prosthetic status of the maxilla and mandible was shown to be significantly associated.²² Attributable to the German health insurance system, there are few people who remain untreated or have 9 or fewer teeth in 1 jaw, because dental checkups are required at least once a year.

Edentulism or tooth loss is known to reduce QOL, as has been reported in many studies.^{4,25-28} In addition, several studies have compared characteristics of edentulous subjects treated with CDs or implant-supported dentures.^{6,16,26,29-31} However, none of the previous studies demonstrated a correlation between oral status and general health and/or specific disease state. To our knowledge, this is the first study in which a ranking of dental/prosthetic status is compared with the impact of different diseases on QOL. There is no doubt that osteoporosis, rheumatism, and vertebral degeneration have a negative effect on the Physical Index in QOL. However, the presence of few remaining teeth (9 or fewer) was also found to negatively affect this outcome.

Because the use of bivariate analysis to screen risk factors for use in multivariable analysis is controversial,²⁴ we included cancer in our regression analyses, because cancer is validated in the German version of the SF-36.²³ We did not expect that the QOL of people with cancer would be better than subjects with 9 or fewer teeth. It is possible that at the time of examination in SHIP our patients suffering from cancer were not currently undergoing chemotherapy or radiotherapy, had no restrictions in their physical movements, and were undertaking surgery that could improve their QOL.

Patients suffering from allergy and hypertension are easily treated with medication, or they might change their lifestyles to prevent allergic reactions or to keep their blood pressure low, so they are able to maintain a good QOL. The same could be said for patients with a reduced dentition without dentures. They may have adapted well to chew and speak. This could explain why the Psychological Index of the SF-12 was not influenced by a low number of remaining teeth. Tooth loss appears to be more of a physical handicap than a psychologic one. Tooth loss in the maxilla is more strongly associated with reduced QOL than the mandible.³⁻⁶ Preserving teeth in the maxilla allows people to communicate, which means that they can take part in social life.³⁻⁶ Participation in social life may be limited due to the reduced masticatory function, but these older people were able to take part. Tooth loss in the mandible has no effect on speaking and has no negative esthetic effects.³⁻⁶

In Germany, the presence of 9 or fewer teeth in the maxilla is ranked on the physical index of QOL between renal diseases and cancer. This study shows that os-

teoporosis, rheumatism, and vertebral degeneration have twice the negative effect on the Physical Index of QOL when compared to a dentition of 9 or fewer teeth (Fig 1). In our opinion, this is a meaningful result for the fields of dentistry and medicine, since it highlights the importance of dental status in general health among the elderly.

Replacing teeth with removable partial or fixed prostheses does not appear to have a significant effect on the psychologic and physical indices of the SF-12. The 2 prosthetic classifications of removable partial (RPD) and fixed prostheses were not included in the final model for regression analyses. What is important is whether or not subjects have missing teeth replaced. Tooth loss without replacement was associated with a decrease in QOL. On the other hand, we hypothesize that the replacement of missing teeth could increase QOL. However, the SF-12 is a generic questionnaire and is not powerful enough, since it does not reflect oral health-related QOL, as do the Oral Health Impact Profile (OHIP) and the General Oral Health Assessment Index (GOHAI). The 5-year follow-up of SHIP will include analyses of OHIP 14.6,8,15,17,26

In summary, QOL in both general and oral health is related to prosthetic status, especially the prosthetic status of the maxilla. In comparison with different disease states, the presence of nine or fewer remaining teeth has a greater impact on reducing QOL than suffering from cancer, hypertension, or allergy. Osteoporosis, rheumatism, and vertebral degeneration had the greatest negative impact on QOL.

Acknowledgment

This study is part of the Community Medicine Research net of the University of Greifswald, Germany, which is funded by the Federal Ministry of Education and Research (grant no. BMBF 01ZZ96030), the Ministry of Cultural Affairs, and the Social Ministry of the Federal State of Mecklenburg-West Pomerania. The CMR gathers several research projects that are sharing data on the population-based Study of Health in Pomerania (SHIP; http://www.medizin.uni-greifswald.de/cm). This study was also funded by the German Research Association (grant no. DFG Ko 799/5-1).

References

- Slade GD. Derivation and validation of a short-form oral health impact profile. Community Dent Oral Epidemiol 1997;25:284–290.
- US Department of Health and Human Services. Healthy People 2000. National Health Promotion and Disease Prevention Objectives. Boston: Jones and Bartlett, 1992.
- Gift HC, Atchison KA. Oral health, health, and health-related quality of life. Med Care 1995;33(suppl II):NS57–77.
- Appollonio I, Carabellese C, Frattola A, Trabucchi M. Dental status, quality of life, and mortality in an older community population: A multivariate approach. J Am Geriatr Soc 1997;45:1315–1323.
- Hallister MC, Weintraub JA. The association of oral status with systemic health, quality of life, and economic productivity. J Dent Educ 1993;57:901–912.



Fig 1 Negative factors on the Physical Index in quality of life, computed by nonstandardized β coefficient in various linear regression analyses.

- Allen PF, McMillan AS, Walshaw D, Locker D. A comparison of the validity of generic- and disease-specific measures in the assessment of oral health-related quality of life. Community Dent Oral Epidemiol 1999;27:344–352.
- Hennessy CH, Moriarty DG, Zack MM, Scherr PA, Brackbill R. Measuring health-related quality of life for public health surveillance. Public Health Rep 1994;109:665–672.
- Allison PJ, Locker D, Feine JS. Quality of life: A dynamic construct. Soc Sci Med 1997;45:221–230.
- Dempster M, Donnelly M. How well do elderly people complete individualised quality of life measures: An exploratory study. Qual Life Res 2000;9:369–375.
- Wilson IB, Cleary PD. Linking clinical variables with health-related quality of life. A conceptual model of patient outcomes. JAMA 1995;273:59–65.
- Bergner M, Bobbitt RA, Carter WB, Gilson BS. The Sickness Impact Profile: Development and final revision of a health status measure. Med Care 1981;19:787–805.
- Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care 1992;473–483.
- Garratt A, Ruta D, Abdalla M, Buckingham K, Russell I. The SF36 health survey questionnaire: An outcome measure suitable for routine use within the NHS? Br Med J 1993;306:1440–1443.
- Kressin N, Spiro A III, Bosse R, Garcia R, Kazis L. Assessing oral health-related quality of life: Findings from the normative aging study. Med Care 1996;34:416–427.
- Heydecke G. Patientenbasierte Messgrössen: Mundgesundheitsbezogene Lebensqualität. Schweiz Monatsschr Zahnmed 2002;112:605–611.
- Awad MA, Locker K, Korner-Bitensky N, Feine JS. Measuring the effect of intra-oral implant rehabilitation on health-related quality of life in a randomized controlled clinical trial. J Dent Res 2000;79:1659–1663.
- Allen PF, McMillan AS, Walshaw D. A patient-based assessment of implant-stabilized and conventional complete dentures. J Prosthet Dent 2001;85:141–147.

- John U, Greiner B, Hensel E, et al. Study of Health in Pomerania (SHIP): A health examination survey in an East German region. Objectives and design. Soz Präventivmed 2001;46:186–194.
- Hensel E, Gesch D, Biffar R, et al. Study of health in Pomerania (SHIP): A health survey in an East German region–Objectives and design on the oral health section. Quintessence Int 2003; 34:370–378.
- von Ferber L. Häufigkeit und Verteilung von Erkrankungen und ihre ärztliche Behandlung: Epidemiologische Grundlagen eines Qualitätsmonitoring. Leipzig: IASB (IASB-Bericht Nr 34), 1994
- 21. Hillier TA, Pedula KL. Characteristics of an adult population with newly diagnosed type 2 diabetes: The relation of obesity and age of onset. Diabetes Care 2001;24:1522–1527.
- Mack F, Mundt T, Budtz-Jørgensen E, et al. The prosthetic status among old adults in Pomerania, related to income, educational levels and general health (results of the Study of Health in Pomerania, SHIP). Int J Prosthodont 2003;16:313–318.
- Bullinger M, Kirchberger I. SF-36, Fragebogen zum Gesundheitszustand. Göttingen: Hogrefe Verlag für Psychologie, 1998.
- Sun GW, Shook TL, Kay GL. Inappropriate use of bivariable analysis to screen risk factors for use in multivariable analysis. J Clin Epidemiol 1996;49:907–916.

- McGrath C, Bedi R. The importance of oral health to older people's quality of life. Gerodontology 1999;16:59–63.
- Allen PF, McMillan AS. The impact of tooth loss in a denture wearing population: An assessment using the Oral Health Impact Profile. Community Dent Health1999;16:176–180.
- Moroi HH, Okimoto K, Terada Y. The effect of an oral prosthesis on the quality of life for head and neck cancer patients. J Oral Rehabil 1999;26:265–273.
- Miura H, Miura K, Mizugai H, Arai Y, Umenai T, Isogai E. Chewing ability and quality of life among the elderly residing in a rural community in Japan. J Oral Rehabil 2000;27:731–734.
- 29. Ettinger RL, Jakobsen JR. A comparison of patient satisfaction and dentist evaluation of overdenture therapy. Community Dent Oral Epidemiol 1997;25:223–227.
- Awad MA, Feine JS. Measuring patient satisfaction with mandibular prostheses. Community Dent Oral Epidemiol 1998;26:400–405.
- Heydecke G, Locker D, Awad MA, Lund JP, Feine JS. Oral and general health-related quality of life with conventional and implant dentures. Community Dent Oral Epidemiol 2003;31:161–168.

Literature Abstract

Chlorhexidine spray versus mouthwash in the control of dental plaque after implant surgery

The aim of this study was to test the difference in efficacy between chlorhexidine mouthrinse and spray. Twenty patients (35 to 68 years of age) in need of implants to restore partially dentate maxilla or mandible were enrolled in the study. Exclusion criteria included: (1) severe systemic disease; (2) chronic diseases requiring antibiotic therapy; (3) smokers consuming more that 10 cigarettes a day; (4) parafunctional habits; (5) need for bone augmentation at proposed implant site; (6) known allergy to chlorhexidine. Patients were randomly assigned to either the spray or mouthwash groups using a computer generated 1:1 randomization list. A baseline prophylaxis was performed on all patients prior to implant placement. One to 5 implants were placed in each patient to total 45 implants (21 implants in the mouthwash group and 24 in the spray group). For 2 weeks following implant placement, patients in the mouthwash group were instructed to rinse with 15 mL of 0.12% chlorehexidine mouthwash twice daily for at least 1 minute. The patients in the spray group were instructed to administer 4 consecutive sprays of 0.2% chlorhexidine to the surgical site twice daily. Antibiotics were given for 2 days as part of postsurgical therapy. The following were evaluated at 7 days and 14 days postsurgery: (1) plaque index of Silness and Loe; (2) stain index; (3) modified gingival index; (4) taste alteration. The difference between groups was analyzed using the nonparametric Mann-Whitney test, and the Wilcoxon test was used to evaluate the differences between the 7- and 14-day observations. Results show that the plaque index increased for both groups, although no significant difference was noted. The mouthrinse group showed a significant increase in the stain index among all teeth as opposed to the spray group. This study shows that the efficacy of the spray chlorhexidine is comparable to the mouthrinse with the added advantage of minimizing generalized tooth staining.

Francetti L, Del Fabbro M, Basso M, Testori T, Taschieri S, Weinstein R. *J Clin Periodontol* 2004;31:857–862. References: 35. Reprints: Dr Luca Francetti, Department of Odontology, Faculty of Medicine, University of Milano Istituto Ortopedico, R Galeazzi, Via Riccardo, Galeazzi, 4, 20161 Milano, Italy. E-mail: luca.francetti@unimi.it —Esquivel-Upshaw, San Antonio, TX Copyright of International Journal of Prosthodontics is the property of Quintessence Publishing Company Inc. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.