

Influence of Prosthetic and Implant Therapy on Satisfaction and Quality of Life: A Systematic Literature Review. Part 1—Characteristics of the Studies

Christoph Strassburger, DDS, Dr Med Dent^a
Guido Heydecke, DDS, Dr Med Dent^b
Thomas Kerschbaum, DDS, Dr Med Dent Habil^c

Purpose: This study systematically searched the dental literature to identify and classify articles on the influence of prosthodontic and dental implant treatment on patient satisfaction and oral health–related quality of life according to their level of evidence.

Materials and Methods: A literature search was carried out for articles published between 1960 and February 2003 using an electronic key word search complemented by hand searching. The retrieved articles were subjected to inclusion and exclusion criteria. Only experimental studies were included; articles that did not focus on the effect of therapy on the patient were excluded from further processing. The levels of evidence of the articles were classified following the guidelines of the US Agency for Health Care Policy and Research. **Results:** A total of 207 publications were identified, of which 114 reports investigating 24,863 patients met the inclusion criteria. Data from the studies were analyzed using SPSS 9.0. Two thirds of the publications showed a low evidence level of III; most were conducted in patients who were edentulous or restored with complete dentures (59% of all studies). Mostly, nonstandardized, custom-made questionnaires (80%) were used. On average, 9 (SD 4.2) outcome variables were used within each trial, but clinical criteria were more often used than psychosocial criteria. The most frequently used questions concerned “chewing function” (86%), esthetics (77%), speech (68%), and general satisfaction (67%). Validated instruments, such as the Oral Health Impact Profile, were increasingly used in recent studies, which were also methodically more sufficient.

Conclusion: Few studies with high levels of evidence were found. Research in this field is still in a phase of development. *Int J Prosthodont* 2004;17:83–93.

Four basic parameters have been described to affect the outcome of prosthetic therapy^{1,2}: (1) biologic and physiologic parameters (health of oral structures, chewing ability, nutritional status, esthetics); (2) longevity and survival (of teeth, implants, restorations); (3) psychosocial parameters (treatment satisfaction, self-esteem, body image, quality of life); and (4) economic parameters (cost of fabrication and maintenance, indirect

cost). Clinical scientists in prosthodontics so far have primarily investigated variables from the first two categories. Patient-based outcomes, including psychosocial parameters and economic outcomes, have been neglected for many years and are only now becoming more popular. However, in recent years, interest in assessing the psychosocial outcomes of oral health and dental therapy has exploded.³

The purpose of this investigation was to identify the current literature on satisfaction and quality of life outcomes in dentistry using a thorough electronic and manual search. The collected literature was systematically reviewed, outcome variables and patient collectives were described, and the publications were classified according to established evidence criteria. It was hypothesized that the number of studies using patient-based outcomes is small and that the level of evidence of such studies is low.

^aAdjunct Lecturer, Preclinical Dentistry, University of Cologne School of Dentistry, Germany.

^bVisiting Professor, Faculty of Dentistry, McGill University, Montréal; and Assistant Professor, Department of Prosthodontics, School of Dentistry, Albert-Ludwigs University, Freiburg, Germany.

^cProfessor and Chair, Preclinical Dentistry, University of Cologne School of Dentistry, Germany.

Correspondence to: Prof Dr T. Kerschbaum, University of Cologne School of Dentistry, Kerpener Strasse 32, D-50931 Koeln, Germany. Fax: + 49-221-478-5964. e-mail: T.Kerschbaum@uni-koeln.de

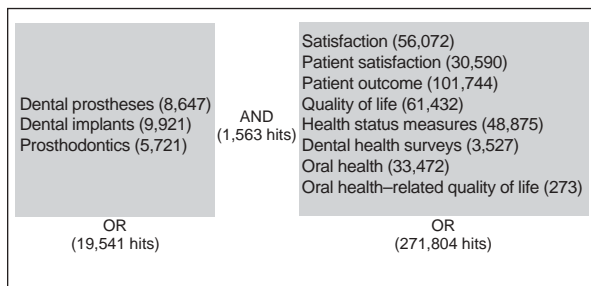


Fig 1 Strategy for the electronic search (limited to key words, Feb 2003).

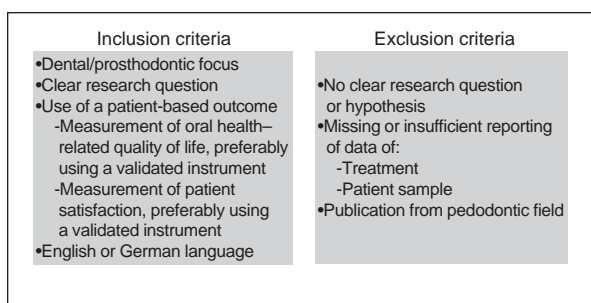


Fig 2 Inclusion and exclusion criteria.

Materials and Methods

Using the software Knowledge Finder (version 4.27, Aries Medical Knowledge), the dental literature from 1960 to February 2003 indexed in the following electronic databases was searched using the key word search strategy depicted in Figs 1 and 2:

- Cochrane Library
 - Cochrane Controlled Trial Register (CCTR)
 - Database of Abstracts of Reviews of Effectiveness (DARE)
- MEDLINE (Knowledge Finder)
- EMBASE (German Institute for Medical Documentation and Information [DIMDI] grips web search)
- 24 dental journals at "Ingenta" (ingenta.com)
- Online search of *Deutsche Zahnärztliche Zeitschrift* (zahnheilkunde.de)
- Online search of *International Poster Journal of Dentistry and Oral Medicine* (ipj.quintessenz.de)

The electronic search was completed February 28, 2003. The reference lists of the retrieved articles were screened for further references.

Inclusion/Exclusion Criteria and Level of Evidence

The primary focus of the search was on systematic reviews, Cochrane reviews, and meta-analyses of randomized controlled clinical trials, which used oral health-related quality of life (OHRQOL) or satisfaction as an outcome of prosthetic intervention (evidence level Ia). Then, randomized controlled trials (evidence level Ib), clinical trials without randomization (evidence level IIa), and other experimental studies (evidence level IIb) were considered. Since a large number of articles were retrospective, nonexperimental studies using OHRQOL outcomes (evidence level III) were also included. To reflect the whole range of publications in the field of patient outcomes in prosthodontics, theoretic and conceptual literature (evidence level IV) was also reviewed, but these publications were not included in the statistical evaluation of the data. The levels of evidence of the articles were classified following the guidelines of the US Agency for Health Care Policy and Research (AHCPR)⁴:

- Ia = evidence obtained from a meta-analysis of randomized controlled trials
- Ib = evidence obtained from at least one randomized controlled trial
- IIa = evidence obtained from at least one well-designed controlled study without randomization
- IIb = evidence obtained from at least one other type of well-designed quasiexperimental study
- III = evidence obtained from well-designed non-experimental studies, such as comparative, correlational, or case studies
- IV = evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities

A number of studies used patient satisfaction with the clinical setting, practitioner, and patient management as the outcome. Since these did not evaluate the effect of therapy, they were excluded from further processing. Further exclusion criteria were insufficient description of the sample characteristics or the therapeutic intervention, and missing or unclear hypotheses (for a complete list, see Fig 2).

Sampling and Data Processing

All identified publications were obtained from the German Library of Medicine (Cologne) and were then independently reviewed by two of the authors, who also applied the exclusion criteria. Relevant publications were archived electronically, and all data were further processed using statistical software (SPSS 9.0).

Table 1 Classification of Level of Evidence of Publications Within Each Time Bracket

Year of publication	Level of evidence				Studies	
	Ib	Ila	Ilb	III	n	%
1960–1980	—	—	—	4	4	4
1981–1985	—	1	2	1	4	4
1986–1990	—	1	1	17	19	17
1991–1995	5	1	—	15	21	18
1996–2003	12	5	10	39	66	58
Total (n)	17	8	13	76	114	
Total (%)	15	7	11	67		100

Table 2 Mean No. of Patients in Studies by Year of Publication

Year of publication	Studies (n)	No. of patients per study		Range
		Mean	SD	
1960–1980	4	222	144	54–398
1981–1985	4	249	422	19–882
1986–1990	19	228	419	13–1,842
1991–1995	21	292	348	15–1,217
1996–2003	66	190	370	10–2,050
Total	114	218	368	10–2,050

SD = standard deviation.

Results

Two hundred seven publications were identified by the search, of which 114 were studies with a total of 24,863 patients. Thirty-seven publications were excluded from further processing because they did not meet inclusion criteria.^{2,5–39} A further 56 articles had a conceptual focus or dealt with theoretic discussions of satisfaction and quality of life issues in dentistry^{3,4,40–93} and were also excluded. The remaining 114 studies^{94–207} were filed electronically. Data such as the year of publication, origin (country), number and age of participants, type of prosthetic condition, and restoration were recorded. In addition, the evidence level was assessed and noted, as were the type (eg, questionnaire or interview) and number of patient-based measurements (eg, Oral Health Impact Profile [OHIP] or custom-made single-item measures of chewing ability or general satisfaction).

The number of studies using quality of life or satisfaction as outcomes have increased steadily over the last 40 years, with an almost exponential growth in the past decade (Table 1). However, a large number of those publications have methodologic shortcomings. About 67% of all publications only reached a low level of evidence (III; retrospective studies). A large portion were case-control studies; only 17 studies published since 1991 represent high levels of evidence.

Study Populations, Dental Status, and Therapeutic Strategies

The total of treated and examined patients in all studies that met inclusion criteria was 24,863. The mean number of subjects per study was 218 (standard deviation [SD] 368). While the variability in number of patients between studies was very large (range 10 to 2,050), there was little change over time in the mean number of subjects (Table 2).

The age of the study samples was reported inconsistently. In only 66 of the 114 studies was age reported in means with SDs. The mean age of all patients was 59 years (SD 9). The majority of the studies reported on completely edentulous subjects (59%); 19% used partially edentulous patients. The remainder of the studies (19%) used mixed samples. Close to 59% of the publications reported on prosthetic therapy for completely edentulous subjects; more than half also included implant-retained prosthetic devices (17 studies, 51%). Those publications surfaced after 1990, and their share increased to 61% between 1996 and 2003. Other therapeutic options were rarely investigated; no specific data were reported in four papers (Table 3).

Methodologic Characteristics

The number of outcomes used in clinical trials has increased markedly. After 1980, the mean number of

Table 3 Classification of Studies by Type of Treatment*

Year of publication	Implant restorations		Nonimplant restorations	
	n	%	n	%
1960–1980	—	—	4	100
1981–1985	1	25	3	75
1986–1990	7	37	12	63
1991–1995	12	57	9	43
1996–2003	38	61	24	39
Total	58	53	52	47

*Missing data in four cases.

Table 4 Mean No. of Clinical and Psychosocial Criteria Used in Identified Studies

Year of publication	No. of studies	All criteria	Clinical criteria	Psychosocial criteria
1960–1980	4	6.8	4.8	2.0
1981–1985	4	5.5	3.5	2.0
1986–1990	19	7.7	4.5	3.2
1991–1995	21	9.9	6.6	3.2
1996–2003	66	9.5	6.6	2.9
Total	114	9.0	6.0	3.0

Table 5 Frequency of Use of Evaluation Criteria in All Identified Studies

Criterion	Clinical	Psychosocial	n	%
1. Chewing function	x		98	86
2. Esthetics	x		88	77
3. Speech function	x		78	68
4. General satisfaction		x	76	67
5. Comfort	x		71	62
6. Technical quality of prosthesis	x		68	59
7. Fit/retention of prosthesis	x		67	59
8. Food choice	x		52	46
9. Social impact		x	49	43
10. Psychologic discomfort		x	46	40
11. Self-esteem		x	46	40
12. Pain	x		45	40
13. Ease of use	x		43	38
14. Activities		x	38	33
15. Adaptation		x	34	30
16. General health	x		28	25
17. Taste	x		27	24
18. Work role		x	24	21
19. Smell	x		24	21
20. General quality of life		x	10	9
21. Intimate relations		x	9	8
22. Cost		x	6	5

parameters was 6.8 (SD 3.4), whereas between 1996 and 2003 the number of criteria increased to 9.5 (SD 4.5). The increase has been mostly driven by the inclusion of psychosocial parameters used to assess quality of life and satisfaction with aspects of treatment (Table 4). The most important criteria were patient assessments of chewing function (86%), esthetics (77%), speech function (68%), and general satisfaction (67%) with prosthetic restorations. The effect of prosthetic therapy on intimate relations was

rarely assessed (8%). The least-used outcome was cost (5%; Table 5).

In the majority of the studies (82%), custom-made, rarely validated questionnaires were used. In five cases, the results of interview surveys were presented.^{96,98,129,136,141} By the late 1980s, validated instruments slowly surfaced. Among those, the Geriatric Oral Health Assessment Index (GOHAI¹⁰⁰), the Dental Impact Profile (DIP¹⁰¹), and the Subjective Oral Health Status Indicators (SOHSI¹¹⁹) had been

described. However, OHIP appears to be the most frequently used and best-documented instrument to date. Between 1990 and 2003, 13 studies using OHIP^{103–111,173,181,186,201} were published.

Levels of Evidence

The few studies that represented high levels of evidence (Ib) primarily focused on patient outcomes after restoration with mandibular implant prostheses. These publications (n = 17) were published after 1991. Most of them describe superior results of mandibular implant overdentures or fixed prostheses as opposed to conventional complete dentures.^{108,112,113,130,139,140,155,161,163,171,194,202} A number of randomized cross-over trials comparing different types of implant prostheses in the mandible^{102,165} and maxilla^{179,199} were also classified into the Ib category. Further trials with an evidence level of IIa also confirmed the results from the above-mentioned trials for implant restorations of the mandible^{110,118,123,137,197,201} and maxilla.¹⁵¹ Two further trials in the IIa classification report on implant restorations of partially edentulous jaws.^{127,193}

Discussion

This review attempted to identify published articles describing the effect of prosthetic therapy on elements of quality of life and patient satisfaction. Despite a thorough and systematic search, no systematic review or meta-analysis addressing this topic was found. Therefore, the focus of this article was to describe and summarize the characteristics of the studies published so far. The content and results of the studies will be part of a forthcoming manuscript.

History

Since the 1980s, interest in the use of patient-based outcome measures in dentistry, like OHRQOL, has steadily increased,³ which is reflected in a growing number of publications. This trend can also be observed in the medical field.⁹² There are several reasons for this development. The assessment of the patient perspective offers new opportunities for the improvement of health and dental care, which is also driven by the conceptual approach of patient-centered care.⁷¹ Further important aspects are consumerism in health care and the allocation of resources based on cost effectiveness of treatment modalities.^{28,34,87}

The evaluation of prosthetic therapy from the patient's perspective has mostly focused on effects at the oral level. More recently, authors have started to assess well-being in relation to the type of treatment, its

burden on the patient, and the economic cost. However, the number of methodologically sound, randomized clinical trials is small. The majority of the identified studies only reached an evidence level of III, somewhat limiting the value of their content. This point of view is shared by other authors.^{3,93} After 1991, a number of studies with an evidence level of Ib were published. This confirms that the quality of the conducted trials investigating the effect of prosthetic therapy on patient-based outcomes is improving and that properly defined research hypotheses are being used in such experimental studies.

Main Outcomes and Future Directions

The publications described in this review primarily demonstrate the negative effect of oral conditions and disease like complete edentulism and complete denture therapy on quality of life.^{97,100,104} While the predominant selection of this most disabling oral condition seems reasonable and medically justified, it also indicates the narrow spectrum of the conducted trials. A common denominator in the conducted trials seemed to be the use of broad questions of general satisfaction, supplemented by more specific items addressing chewing and speech function as well as comfort and esthetics.¹³⁴ These factors seemed to be regarded as the most relevant, and for some of them, this has been confirmed.¹²⁸ One problem of nonspecific, broad questions is the high number of false-positive responses; therefore, these types of questions should always be complemented by more specific items.^{42,144}

The simple measurement of satisfaction with a prosthetic rehabilitation falls short when assessing the effect of dental care on a person as a whole.²³ OHRQOL is a multidimensional idea that embraces this holistic perspective. It can be defined as a person's assessment of how functional, psychological, and social factors and pain/discomfort affect his or her well-being—in the context of oral health.²⁰⁸ The development of validated multi-item questionnaires for the measurement of OHRQOL has made significant progress in the past decade. However, this has also led to longer, more complex instruments. The inclusion of psychosocial effects is one of the characteristics of OHIP,¹⁰³ a validated multi-item questionnaire. The use of standardized questionnaires to some extent allows comparison between studies. Some studies have suggested that depending on their age and general health status, subjects assign different levels of importance to certain aspects of OHRQOL.^{105,119,159} However, for OHIP, the use of weighted item scores has no effect on the total score.^{21,74} Recent developments include attempts to modify (eg, shorten and revalidate) existing instruments.¹⁸¹

Regarding the type of restorations, a positive effect on OHRQOL has been reported for implant-retained overdentures^{108,110,112,113,130,140} as well as fixed prostheses.^{102,127} The effect of the technical correctness and quality of prosthetic restorations has been scarcely investigated. Three studies postulate a moderate positive and significant correlation between technical quality of dental prostheses and satisfaction/quality of life.^{115,148,158} Still, it remains unclear if prosthetic dental care has any effect on general health-related quality of life,^{29,106} and there is a lack of evidence for the efficacy of traditional fixed, combined-fixed, and removable prosthetic restorations.

Conclusion

The high number of publications from the area of general medicine illustrate that outcomes and quality of life research in general medicine has progressed at a much faster pace than in the dental field.^{49,92} Therefore, the state of the outcomes research in dentistry is not yet satisfactory. Methodically more refined studies are required to assess the effects of a broader spectrum of restorative therapeutic approaches on OHRQOL. While some encouraging results have been published, outcomes research in restorative and prosthetic dentistry is still in its early stages. It is hard to predict the pace at which further progress will be made. However, since improvement of OHRQOL has been demonstrated for some restorative options (eg, mandibular implant overdentures), it will be imperative to also demonstrate if these treatments are cost effective. This will give further rise to patient outcomes as one component in dental health economics.

References

- Anderson JD. The need for criteria on reporting treatment outcomes. *J Prosthet Dent* 1998;79:49–55.
- Guckes AD, Scurria MS, Shugars DA. A conceptual framework for understanding outcomes of oral implant therapy. *J Prosthet Dent* 1996;75:633–639.
- Buck D, Newton JT. Non-clinical outcome measures in dentistry: Publishing trends 1988–98. *Community Dent Oral Epidemiol* 2001;29:2–8.
- Agency for Health Care Policy and Research. Acute pain management: Operative or medical procedures and trauma. Rockville, MD: US Department of Health and Human Services, AHCP, 1992.
- Broder HL, Slade G, Caine R, Reisine S. Perceived impact of oral health conditions among minority adolescents. *J Public Health Dent* 2000;60:189–192.
- Cune MS, de PC, Hoogstraten J. Treatment outcome with implant-retained overdentures: Part I—Clinical findings and predictability of clinical treatment outcome. *J Prosthet Dent* 1994;72:144–151.
- Gurdal P, Cankaya H, Onem E, Dincer S, Yilmaz T. Factors of patient satisfaction/dissatisfaction in a dental faculty outpatient clinic in Turkey. *Community Dent Oral Epidemiol* 2000;28:461–469.
- John M. Mehrdimensionaler Therapieerfolg für schmerzhafte kranio-mandibuläre Dysfunktionen. *Dtsch Zahnarztl Z* 1999;54:391–395.
- Leicher R. Patienten-Zufriedenheit ist messbar? *Arzt Wirtsch* 2000;4:65.
- Lahti S, Verkasalo M, Hausen H, Tuutti H. Ideal role behaviours as seen by dentists and patients themselves and by their role partners: Do they differ? *Community Dent Oral Epidemiol* 1996;24:245–248.
- 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.
- Mauro G, Tagliaferro G, Montini M, Zanolla L. Diffusion model of pain language and quality of life in orofacial pain patients. *J Orofac Pain* 2001;15:36–46.
- Tapsoba H, Deschamps JP, Leclercq MH. Factor analytic study of two questionnaires measuring oral health-related quality of life among children and adults in New Zealand, Germany and Poland. *Qual Life Res* 2000;9:559–569.
- Zitzmann NU, Marinello CP. Treatment outcomes of fixed or removable implant-supported prostheses in the edentulous maxilla. Part II: Clinical findings. *J Prosthet Dent* 2000;83:434–442.
- Miller WA. Does oral health influence quality of life? *Gerodontology* 1987;3:99.
- Feine JS, Dufresne E, Boudrias P, Lund JP. Outcome assessment of implant-supported prostheses. *J Prosthet Dent* 1998;79:75–79.
- Nikias M. Oral disease and quality of life. *Am J Public Health* 1985;75:11–12.
- Sheiham A, Croog SH. The psychosocial impact of dental diseases on individuals and communities. *J Behav Med* 1981;4:257–272.
- Türp JC, Heiss HW. Lebensqualität bei alternden Menschen. *Zahnarztl Mitt* 1999;89(22):62–67.
- Thines T, Karuza J, Miller WA. Oral health impact on quality of life: Methodological and conceptual concerns. *Gerodontology* 1987;3:100–102.
- Gift HC, Redford M. Oral health and the quality of life. *Clin Geriatr Med* 1992;8:673–683.
- Hollister MC, Weintraub JA. The association of oral status with systematic health, quality of life, and economic productivity. *J Dent Educ* 1993;57:901–910.
- Heydecke G. Implantologie—Wohlbefinden für Senioren. *Zahnarztl Mitt* 2000;90(21):52–57.
- Demers M, Brodeur JM, Simard P, Vallee R. Problems associated with edentulism among the elderly. *J Can Dent Assoc* 1986;52:1019–1022.
- Demers M, Bourdages J, Brodeur JM, Benigeri M. Indicators of masticatory performance among elderly complete denture wearers. *J Prosthet Dent* 1996;75:188–193.
- Kent G, Johns R. Controlled longitudinal study on the psychological effects of osseointegrated dental implants. *Int J Oral Maxillofac Implants* 1991;6:470–474.
- Wismeijer D, van Waas MAJ, Vermeeren JJJF, Kalk W. Patients perception of sensory disturbances of the mental nerve before and after implant surgery: A prospective study of 110 patients. *Br J Oral Maxillofac Surg* 1997;35:254–259.
- Heydecke G. Patientenzufriedenheit als Ergebnisgröße in klinischen Studien zur Mundgesundheit. *Schweiz Monatsschr Zahnmed* 2002;112:229–336.
- Locker D. Patient-based assessment of the outcomes of implant therapy: A review of the literature. *Int J Prosthodont* 1998;11:453–461.
- de Bruyn H, Lindén U, Collaert B, Bjorn AL. Quality of fixed restorative treatment on Brånemark implants. A 3-year follow-up study in private dental practices. *Clin Oral Implants Res* 2000;11:248–255.

31. Feine JS, Carlsson GE, Awad MA, et al. The McGill consensus statement on overdentures. Mandibular two-implant overdentures as first choice standard of care for edentulous patients. Montreal, Quebec, May 24–25, 2002. *Eur J Prosthodont Restorative Dent* 2002;10:95–96.
32. Feine JS, Carlsson GE, Awad MA, et al. The McGill consensus statement on overdentures. Montreal, Quebec, Canada. May 24–25, 2002. *Int J Prosthodont* 2002;15:413–414.
33. Hayes C. The use of patient based outcome measures in clinical decision making. *Community Dent Health* 1998;15:19–21.
34. Heydecke G. Patientenbasierte Messgrößen: Mundgesundheitsbezogene Lebensqualität. *Schweiz Monatsschr Zahnmed* 2002;112:605–611.
35. Tickle M, Craven R, Blinkhorn AS. An evaluation of a measure of subjective oral health status in the UK. *Community Dent Health* 1997;14:175–180.
36. Locker D, Matear D, Stephens M, Lawrence H, Payne B. Comparison of the GOHAI and OHIP-14 as measures of the oral health-related quality of life of the elderly. *Community Dent Oral Epidemiol* 2001;29:373–381.
37. McGrath C, Bedi R. Measuring the impact of oral health on life quality in two national surveys—Functionalist versus hermeneutic approaches. *Community Dent Oral Epidemiol* 2002;30:254–259.
38. McGrath C, Bedi R. Can dental attendance improve quality of life? *Br Dent J* 2001;190:262–265.
39. Seybold SV, Milano M. Anterior stainless steel crowns and their impact on the quality of life in pediatric patients. *Tex Dent J* 2002;119:924–931.
40. Albrecht G, Hoogstraten J. Satisfaction as a determinant of compliance. *Community Dent Oral Epidemiol* 1998;26:139–146.
41. Antczak-Bouckoms A, Marbach JJ, Glass EG, Glaros A. Temporomandibular Disorders and Related Pain Conditions. *Progress in Pain Research and Management, Vol 4*. Sessle BJ, Bryant P, Dionne R (eds). Seattle: IASP, 1995:237–248.
42. Aust B. Zufriedene Patienten? Eine Kritische Diskussion von Zufriedenheitsuntersuchungen in der Gesundheitlichen Versorgung. Berlin: Wissenschaftszentrum Berlin für Sozialforschung, Forschungsgruppe Gesundheitsrisiken und Präventionspolitik, 1994:46.
43. Alford BL. Affect, attribution, and disconfirmation: Their impact on health care services evaluation. *Health Mark Q* 1998;15:55–74.
44. Antczak-Bouckoms A. Quality and effectiveness issues related to oral health. *Med Care* 1995;33:123–142.
45. Brockhaus FA. *Brockhaus Gesundheit*. Leipzig, Germany: Brockhaus, 2001.
46. Brockhaus FA. *Der Brockhaus in Einem Band*, ed 9. Leipzig, Germany: Brockhaus, 2001.
47. Börkircher H. Erfolgspotential Patientenzufriedenheit. *Zahnarzt Prax* 2001;4:206–211.
48. Bellach BM, Ellert U, Radoschewski M. Der SF-36 im Bundesgesundheitsurvey. Erste Ergebnisse und neue Fragen. *Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz* 2000;43:210–216.
49. Bullinger M. Gesundheitsbezogene Lebensqualität und subjektive Gesundheit. *Psychother Psychosom Med Psychol* 1997;47:76–91.
50. Dolan TA, Peek CW, Stuck AE, Beck JC. Three-year changes in global oral health rating by elderly dentate adults. *Community Dent Oral Epidemiol* 1998;26:62–69.
51. Engel GL. The need for a new medical model: A challenge for biomedicine. *Science* 1977;196:129–136.
52. Giddon DB. Oral health and the quality of life. *J Am Coll Dent* 1987;54:10–15.
53. Gooch BF, Dolan TA, Bourque LB. Correlates of self-reported dental health status upon enrollment in the Rand Health Insurance Experiment. *J Dent Educ* 1989;53:629–637.
54. Gift HC, Atchison KA, Dayton CM. Conceptualizing oral health and oral health-related quality of life. *Soc Sci Med* 1997;44:601–608.
55. Gift HC, Atchison KA. Oral health, health, and health-related quality of life. *Med Care* 1995;33:57–77.
56. Hakestam U, Soderfeldt B, Ryden O, Glantz PO. Personality factors versus expectations and self-reported symptoms among patients awaiting advanced prosthodontic treatment. *Eur J Prosthodont Restorative Dent* 1997;5:105–110.
57. Ismail AI, Bader JD, Kamerow DB. Systematic reviews and the practice of evidence-based dentistry: Professional and policy implications. *J Am Coll Dent* 1999;66:5–12.
58. Jadad AR, Moore RA, Carroll D, et al. Assessing the quality of reports of randomized clinical trials: Is blinding necessary? *Control Clin Trials* 1996;17:1–12.
59. John M, Micheelis W. Lebensqualitätsforschung in der Zahnmedizin: Konzepte Erfahrungen und Perspektiven. *IDZ-Information* 2000;4:2–22.
60. Kressin NR. Associations among different assessments of oral health outcomes. *J Dent Educ* 1996;60:501–507.
61. Kressin NR, Spiro A, 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.
62. Kressin NR, Atchison KA, Miller DR. Comparing the impact of oral disease in two populations of older adults: Application of the Geriatric Oral Health Assessment Index. *J Public Health Dent* 1997;57:224–232.
63. Kiyak HA, Mulligan K. Studies of the relationship between oral health and psychological well-being. *Gerodontology* 1987;3:109–112.
64. Kerschbaum T, Wende KU. Compliance von Schmerz-Dysfunktions-Patienten. *Dtsch Zahnarzt Z* 2001;56:322–326.
65. Locker D. Measuring oral health: A conceptual framework. *Community Dent Health* 1988;5:3–18.
66. Leao A, Sheiham A. The development of a socio-dental measure of dental impacts on daily living. *Community Dent Health* 1996;13:22–26.
67. Lohr KN, Carey TS. Assessing “best evidence”: Issues in grading the quality of studies for systematic reviews. *Jt Comm J Qual Improv* 1999;25:470–479.
68. Locker D. Issues in measuring change in self-perceived oral health status. *Community Dent Oral Epidemiol* 1998;26:41–47.
69. Locker D, Kressin NR. Introduction to the symposium. *Community Dent Oral Epidemiol* 1998;26:39–40.
70. Locker D, Clarke M, Payne B. Self-perceived oral health status, psychological well-being, and life satisfaction in an older adult population. *J Dent Res* 2000;79:970–975.
71. Mead N, Bower P. Patient-centredness: A conceptual framework and review of the empirical literature. *Soc Sci Med* 2000;51:1087–1110.
72. McGrath C, Bedi R, Gilthorpe MS. Oral health related quality of life—Views of the public in the United Kingdom. *Community Dent Health* 2000;17:3–7.
73. McGrath C, Bedi R. The importance of oral health to older people’s quality of life. *Gerodontology* 1999;16:59–63.
74. McGrath C, Bedi R. A study of the impact of oral health on the quality of life of older people in the UK—Findings from a national survey. *Gerodontology* 1999;15:93–98.
75. Powell RN, McEnery TM. The Brisbane Statistical Division Survey of Adult Dental Health 1984. 2. Sociological aspects of the survey. *Aust Dent J* 1988;33:14–17.
76. Proskin HM, Volpe AR. Meta-analysis in dental research: A paradigm for performance and interpretation. *J Clin Dent* 1994;5:19–26.
77. Rosenberg D, Kaplan S, Senie R, Badner V. Relationships among dental functional status, clinical dental measures, and generic health measures. *J Dent Educ* 1988;52:653–657.

78. Reisine S. Dental health and public policy: The social impact of dental disease. *Am J Public Health* 1985;75:27–30.
79. Reisine S, Weber J. The effects of temporomandibular joint disorders on patients quality of life. *Community Dent Health* 1989;6: 257–270.
80. Scrivens E, Cunningham D, Charlton J, Holland WW. Measuring the impact of health interventions: A review of available instruments. *Eff Health Care* 1985;2:247–261.
81. Slade G. Assessing change in quality of life using the Oral Health Impact Profile. *Community Dent Oral Epidemiol* 1998;26:52–61.
82. Slade GD, Strauss RP, Atchison KA, Kressin NR, Locker D, Reisine ST. Conference summary: Assessing oral health outcomes—Measuring health status and quality of life. *Community Dent Health* 1998;15:3–7.
83. Schwartz FW. *Das Public Health Buch: Gesundheit und Gesundheitswesen*. Munich, Germany: Urban und Schwarzenberg, 1998.
84. World Health Organization. *International Classification of Functioning, Disability and Health*. Geneva: WHO, 2001.
85. Worthington HV. Statistical aspects of measuring change in oral health status of older adults. *Community Dent Oral Epidemiol* 1998;26:48–51.
86. Weintraub JA. Uses of oral health related quality of life measures in public health. *Community Dent Health* 1998;15:8–12.
87. Walther W, Micheelis W. *Evidence-Based Dentistry*. Köln, Germany: Institut der Deutschen Zahnärzte, 2000:245.
88. Schneller T, Bauer R, Micheelis W. *Psychologische Aspekte bei der Zahnmedizinischen Versorgung*. Köln, Germany: Deutscher Ärzte, 1998:131.
89. Strippl H. *Inaugural Dissertation zur Erlangung des Doktorgrades der Zahnheilkunde dem Fachbereich Humanmedizin der Philipps-Universität Marburg. Die Zufriedenheit der Bevölkerung mit der Zahnmedizinischen Versorgung*. Marburg, Germany: Philipps-Universität Marburg, 1994:158.
90. Egger M, Smith GD, Altman DG. *Systematic Reviews in Health Care, Meta-Analysis in Context*, ed 2. London: BMJ, 2001:487.
91. Luthardt R, Spiekermann J, Böning K, Walter M. Systematische Aufarbeitung prothetischer Literatur. *Optionen und Probleme*. *ZWR* 2001;110:647–654.
92. Sanders C, Egger M, Donovan J, Tallon D, Frankel S. Reporting on quality of life in randomised controlled trials: Bibliographic study. *Br Med J* 1998;317:1191–1194.
93. Jokstad A, Esposito M, Coulthard P, Worthington HV. The reporting of randomized controlled trials in prosthodontics. *Int J Prosthodont* 2002;15:230–242.
94. Carlsson GE, Otterland A, Wennström A. Patient factors in appreciation of complete dentures. *J Prosthet Dent* 1967;17:322–328.
95. Bergman B, Carlsson GE. Review of 54 complete denture wearers: Patients opinions 1 year after treatment. *Acta Odontol Scand* 1972;30:399–414.
96. Smith JM, Sheiham A. How dental conditions handicap the elderly. *Community Dent Oral Epidemiol* 1979;7:305–310.
97. Cushing AM, Sheiham A, Maizels J. Developing socio-dental indicators—The social impact of dental disease. *Community Dent Health* 1986;3:3–17.
98. Heyink J, Schaub R. Denture problems and the quality of life in a Dutch elderly population. *Community Dent Oral Epidemiol* 1986; 14:193–194.
99. Reisine S, Fertig J, Weber J, Leder S. Impact of dental conditions on patients' quality of life. *Community Dent Oral Epidemiol* 1989;17:7–10.
100. Atchison KA, Dolan TA. Development of the Geriatric Oral Health Assessment Index. *J Dent Educ* 1990;54:680–687.
101. Strauss RP, Hunt RJ. Understanding the value of teeth to older adults: Influences on the quality of life. *J Am Dent Assoc* 1993;124: 105–110.
102. de Grandmont P, Feine JS, Tache R, et al. Within-subject comparisons of implant-supported mandibular prostheses: Psychometric evaluation. *J Dent Res* 1994;73:1096–1104.
103. Slade GD, Spencer AJ. Development and evaluation of the Oral Health Impact Profile. *Community Dent Health* 1994;11:3–11.
104. Slade G, Spencer AJ. Social impact of oral conditions among older adults. *Aust Dent J* 1994;39:358–364.
105. Slade G, Hoskin GW, Spencer AJ. Trends and fluctuations in the impact of oral conditions among older adults during a one year period. *Community Dent Oral Epidemiol* 1996;24:317–321.
106. 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.
107. Allen PF, McMillan AS. The impact of tooth loss in a denture wearing population: An assessment using the Oral Health Impact Profile. *Community Dent Health* 1999;16:176–180.
108. Awad MA, Locker D, 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.
109. Allison P, Locker D, Jokovic A, Slade G. A cross-cultural study of oral health values. *J Dent Res* 1999;78:643–649.
110. Allen PF, McMillan AS, Locker D. An assessment of sensitivity to change of the Oral Health Impact Profile in a clinical trial. *Community Dent Oral Epidemiol* 2001;29:175–182.
111. Locker D, Slade G. Oral health and the quality of life among older adults: The Oral Health Impact Profile. *J Can Dent Assoc* 1993;59:830–844.
112. Boerrigter EM, Stegenga B, Raghoobar GM, Boering G. Patient satisfaction and chewing ability with implant-retained mandibular overdentures: A comparison with new complete dentures with or without preprosthetic surgery. *J Oral Maxillofac Surg* 1995;53: 1167–1173.
113. Geertman ME, van Waas MAJ, van't Hof MA, Kalk W. Denture satisfaction in a comparative study of implant-retained mandibular overdentures: A randomized clinical trial. *Int J Oral Maxillofac Implants* 1996;11:194–200.
114. Hakestam U, Söderfeldt B, Ryden O, Glantz E, Glantz PO. Dimensions of satisfaction among prosthodontic patients. *Eur J Prosthodont Restorative Dent* 1997;5:111–117.
115. Hakestam U, Karlsson T, Söderfeldt B, Ryden O, Glantz PO. Does the quality of advanced prosthetic dentistry determine patient satisfaction? *Acta Odontol Scand* 1997;55:365–371.
116. Hakestam U, Glantz E, Soderfeldt B, Glantz PO. What do patients expect from extensive restorative dental treatment? *Eur J Prosthodont Restorative Dent* 1996;4:53–57.
117. Albrektsson T, Blomberg S, Brånemark A, Carlsson GE. Edentulousness—An oral handicap. Patient reactions to treatment with jawbone-anchored prostheses. *J Oral Rehabil* 1987;14:503–511.
118. Blomberg S, Lindquist LW. Psychological reactions to edentulousness and treatment with jawbone-anchored bridges. *Acta Psychiatr Scand* 1983;68:251–262.
119. Locker D, Miller Y. Evaluation of Subjective Oral Health Status Indicators. *J Public Health Dent* 1994;54:167–176.
120. Fenlon MR, Palmer RM, Palmer P, Newton JT, Sherriff M. A prospective study of single stage surgery for implant supported overdentures. *Clin Oral Implants Res* 2002;13:365–370.
121. Luotio K, Turunen J, Hanhela M. Besser Lachen und Kauen; Implantate—Lebensqualität und Mundhygiene. *Implantol J* 2000; 3:68–70.
122. 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.

123. Burns DR, Unger JW, Elswick RKJ, Giglio JA. Prospective clinical evaluation of mandibular implant overdentures: Part II—Patient satisfaction and preference. *J Prosthet Dent* 1995;73:364–369.
124. Gunne HS. The effect of removable partial dentures on mastication and dietary intake. *Acta Odontol Scand* 1985;43:269–278.
125. Gunne HS, Wall AK. The effect of new complete dentures on mastication and dietary intake. *Acta Odontol Scand* 1985;43:257–268.
126. Cune MS, de Putter C, Hoogstraten J. Treatment outcome with implant-retained overdentures: Part II—Patient satisfaction and predictability of subjective treatment outcome. *J Prosthet Dent* 1994;72:152–158.
127. Kuboki T, Okamoto S, Suzuki H, et al. Quality of life assessment of bone-anchored fixed partial denture patients with unilateral mandibular distal-extension edentulism. *J Prosthet Dent* 1999;82:182–187.
128. Awad MA, Feine JS. Measuring patient satisfaction with mandibular prostheses. *Community Dent Oral Epidemiol* 1998;26:400–405.
129. Barenthin I. Dental health status and dental satisfaction. *Int J Epidemiol* 1977;6:73–79.
130. Bouma J, Boerrigter LM, van Oort RP, van Sonderen E, Boering G. Psychosocial effects of implant-retained overdentures. *Int J Oral Maxillofac Implants* 1997;12:515–522.
131. Cibirka RM, Razzoog M, Lang BR. Critical evaluation of patient responses to dental implant therapy. *J Prosthet Dent* 1997;78:574–581.
132. Clancy JM, Buchs AU, Ardjmand H. A retrospective analysis of one implant system in an oral surgery practice. Phase I: Patient satisfaction. *J Prosthet Dent* 1991;65:265–271.
133. Ettinger RL, Jakobsen JR. A comparison of patient satisfaction and dentist evaluation of overdenture therapy. *Community Dent Oral Epidemiol* 1997;25:223–227.
134. Frank RP, Milgrom P, Leroux BG, Hawkins NR. Treatment outcomes with mandibular removable partial dentures: A population based study of patient satisfaction. *J Prosthet Dent* 1998;80:36–45.
135. Fenlon MR, Sherriff M, Walter JD. Association between the accuracy of intermaxillary relations and complete denture usage. *J Prosthet Dent* 1999;81:520–525.
136. Fiske J, Davis DM, Frances C, Gelbier S. The emotional effects of tooth loss in edentulous people. *Br Dent J* 1998;184:90–93.
137. Blomberg S. Psychiatric aspects of patients treated with bridges on osseointegrated fixtures. *Swed Dent J Suppl* 1985;28:183–192.
138. Frank RP, Brudvik JS, Leroux BG, Milgrom P, Hawkins NR. Relationship between the standards of removable partial denture construction, clinical acceptability, and patient satisfaction. *J Prosthet Dent* 2000;83:521–527.
139. Naert IE, Gizani S, Vuylsteke M, van Steenberghe D. A randomized clinical trial on the influence of splinted and unsplinted oral implants in mandibular overdenture therapy. A 3-year report. *Clin Oral Invest* 1997;1:81–88.
140. Naert I, Gizani S, Vuylsteke M, van Steenberghe D. A 5-year prospective randomized clinical trial on the influence of splinted and unsplinted oral implants retaining a mandibular overdenture: Prosthetic aspects and patient satisfaction. *J Oral Rehabil* 1999;26:195–202.
141. Petersen PE, Nörtov B. General and dental health in relation to life-style and social network activity among 67-year-old Danes. *Scand J Prim Health Care* 1989;7:225–230.
142. Sheiham A, Steele JG, Marcenes W, Tsakos G, Finch S, Walls AWG. Prevalence of impacts of dental and oral disorders and their effects on eating among older people: A national survey in Great Britain. *Community Dent Oral Epidemiol* 2001;29:195–203.
143. Gregory M, Murphy WM, Scott J, Watson CJ, Reeve PE. A clinical study of the Brånemark dental implant system. *Br Dent J* 1990;168:18–23.
144. Smedley TC, Friedrichsen SW, Cho MH. A comparison of self-assessed satisfaction among wearers of dentures, hearing aids, and eyeglasses. *J Prosthet Dent* 1989;62:654–661.
145. Schrenker H, Stark H. Mehr Lebensqualität für alte Menschen durch einen den gestiegenen Bedürfnissen entsprechenden Zahnersatz. *Geriatr Forsch* 1996;6:177–184.
146. Hoogstraten J, Lamers LM. Patient satisfaction after insertion of an osseointegrated implant bridge. *J Oral Rehabil* 1987;14:481–487.
147. Grogono A, Gardiner D, Finger I. Functional and psychological factors influencing patient attitudes towards implant prostheses. *Oral Health* 1997;87:15–18, 21.
148. van Waas MAJ. Determinants of dissatisfaction with dentures: A multiple regression analysis. *J Prosthet Dent* 1990;64:569–572.
149. Wayler AH, Chauncey HH. Impact of complete dentures and impaired natural dentition on masticatory performance and food choice in healthy aging men. *J Prosthet Dent* 1983;49:427–433.
150. Watson RM, Jemt T, Chai J, et al. Prosthodontic treatment, patient response, and the need for maintenance of complete implant-supported overdentures: An appraisal of 5 years of prospective study. *Int J Prosthodont* 1997;10:345–354.
151. Zitzmann NU, Marinello CP. Treatment outcomes of fixed or removable implant-supported prostheses in the edentulous maxilla. Part I: Patients' assessments. *J Prosthet Dent* 2000;83:424–433.
152. Grogono A, Lancaster DM, Finger IM. Dental implants: A survey of patients' attitudes. *J Prosthet Dent* 1989;62:573–576.
153. Gunay H, Veltmaat A, Schneller T, Neukam FW. Psychologische Aspekte bei Patienten nach Implantatversorgung. *Dtsch Zahnärztl Z* 1991;46:698–701.
154. Kalk W, de Baat C. Patients' complaints and satisfaction 5 years after complete denture treatment. *Community Dent Oral Epidemiol* 1990;18:27–31.
155. Kapur KK. Comparisons between fixed partial dentures supported by blade-vent implants and removable partial dentures. Part IV: Comparisons of patient satisfaction between two treatment modalities. *J Prosthet Dent* 1991;66:517–530.
156. Yoshida M, Sato Y, Akagawa Y, Hiasa K. Correlation between quality of life and denture satisfaction in elderly complete denture wearers. *Int J Prosthodont* 2001;14:77–80.
157. Berg E. A 2-year follow-up study of patient satisfaction with new complete dentures. *J Dent* 1988;16:160–165.
158. Pietrokovski J, Harfin J, Mostavoy R, Levy F. Oral findings in elderly nursing home residents in selected countries: Quality of and satisfaction with complete dentures. *J Prosthet Dent* 1995;73:132–135.
159. Micheelis W, Reich E. Dritte Deutsche Mundgesundheitsstudie (DMS III). Köln, Germany: Institut der Deutschen Zahnärzte, 1997:530.
160. Meeuwissen JH. Perception of Oral Function of Dentate Elderly. Nijmegen, The Netherlands: University of Nijmegen, 1992:113.
161. Boerrigter EM, Geertman ME, van Oort RP, et al. Patient satisfaction with implant-retained mandibular overdentures. A comparison with new complete dentures not retained by implants—A multicentre randomized clinical trial. *Br J Oral Maxillofac Surg* 1995;33:282–288.
162. Kiyak HA, Beach BH, Worthington P, Taylor T, Bolender C, Evans J. Psychological impact of osseointegrated dental implants. *Int J Oral Maxillofac Implants* 1990;5:61–69.
163. Meijer HJ, Raghoobar GM, van't Hof MA, Geertman ME, van Oort RP. Implant-retained mandibular overdentures compared with complete dentures: A 5-year follow-up study of clinical aspects and patient satisfaction. *Clin Oral Implants Res* 1999;10:238–244.
164. Müller F, Wahl G, Fuhr K. Age-related satisfaction with complete dentures, desire for improvement and attitudes to implant treatment. *Gerodontology* 1994;11:7–12.

165. Tang L, Lund JP, Tache R, Clokie CM, Feine JS. A within-subject comparison of mandibular long-bar and hybrid implant-supported prostheses: Psychometric evaluation and patient preference. *J Dent Res* 1997;76:1675–1683.
166. Tavares M, Branch LG, Shulman L. Dental implant patients and their satisfaction with treatment. *J Dent Educ* 1990;54:670–679.
167. van Waas MAJ. The influence of clinical variables on patients' satisfaction with complete dentures. *J Prosthet Dent* 1990;63:307–310.
168. van Waas MAJ, Meeuwissen JH, Meeuwissen R, Käyser A, Kalk W, van't Hof MA. Relationship between wearing a removable partial denture and satisfaction in the elderly. *Community Dent Oral Epidemiol* 1994;22:315–318.
169. van Waas MAJ. The influence of psychologic factors on patient satisfaction with complete dentures. *J Prosthet Dent* 1990;63:545–548.
170. Vervoorn JM, Duinkerke AS, Luteijn F, van de Poel AC. Assessment of denture satisfaction. *Community Dent Oral Epidemiol* 1988;16:364–367.
171. Wismeijer D, van Waas MAJ, Vermeeren JIJF, Mulder J, Kalk W. Patient satisfaction with implant-supported mandibular overdentures. A comparison of three treatment strategies with ITI-dental implants. *Int J Oral Maxillofac Surg* 1997;26:263–267.
172. Yi SW, Carlsson GE, Ericsson I, Wennström JL. Long-term follow-up of cross-arch fixed partial dentures in patients with advanced periodontal destruction: Evaluation of occlusion and subjective function. *J Oral Rehabil* 1996;23:186–196.
173. John M, Micheelis W. Mundgesundheitsbezogene Lebensqualität in der Bevölkerung: Grundlagen und Ergebnisse des Oral Health Impact Profile (OHIP) aus einer repräsentativen Stichprobe in Deutschland. *IDZ-Information* 2003;1:1–28.
174. Wolff A, Gadre A, Begleiter A, Moskona D, Cardash H. Correlation between patient satisfaction with complete dentures and denture quality, oral condition, and flow rate of submandibular/sublingual salivary glands. *Int J Prosthodont* 2003;16:45–48.
175. Zlataric DK, Celebic A. Treatment outcomes with removable partial dentures: A comparison between patient and prosthodontist assessments. *Int J Prosthodont* 2001;14:423–426.
176. Kaptein ML, Hoogstraten J, de PC, de LGL, Blijdorp PA. Dental implants in the atrophic maxilla: Measurements of patients' satisfaction and treatment experience. *Clin Oral Implants Res* 1998;9:321–326.
177. de Bruyn H, Collaert B, Lindén U, Bjorn AL. Patient's opinion and treatment outcome of fixed rehabilitation on Brånemark implants. A 3-year follow-up study in private dental practices. *Clin Oral Implants Res* 1997;8:265–271.
178. Sonoyama W, Kuboki T, Okamoto S, et al. Quality of life assessment in patients with implant-supported and resin-bonded fixed prosthesis for bounded edentulous spaces. *Clin Oral Implants Res* 2002;13:359–364.
179. de Albuquerque RF Jr, Lund JP, Tang L, et al. Within-subject comparison of maxillary long-bar implant-retained prostheses with and without palatal coverage: Patient-based outcomes. *Clin Oral Implants Res* 2000;11:555–565.
180. Dervis E. Clinical assessment of common patient complaints with complete dentures. *Eur J Prosthodont Restorative Dent* 2002;10:113–117.
181. Allen F, Locker D. A modified short version of the Oral Health Impact Profile for assessing health-related quality of life in edentulous adults. *Int J Prosthodont* 2002;15:446–450.
182. Ekfeldt A, Johansson LA, Isaksson S. Implant-supported overdenture therapy: A retrospective study. *Int J Prosthodont* 1997;10:366–374.
183. Chang M, Ödman P, Wennström JL, Andersson B. Esthetic outcome of implant-supported single-tooth replacements assessed by the patient and by prosthodontists. *Int J Prosthodont* 1999;12:335–341.
184. Davis DM, Packer ME. Mandibular overdentures stabilized by Astra Tech implants with either ball attachments or magnets: 5-year results. *Int J Prosthodont* 1999;12:222–229.
185. Harle TJ, Anderson JD. Patient satisfaction with implant-supported prostheses. *Int J Prosthodont* 1993;6:153–162.
186. Locker D, Matear D, Stephens M, Jokovic A. Oral health-related quality of life of a population of medically compromised elderly people. *Community Dent Health* 2002;19:90–97.
187. Levine RA, Clem D, Beagle J, et al. Multicenter retrospective analysis of the solid-screw ITI implant for posterior single-tooth replacements. *Int J Oral Maxillofac Implants* 2002;17:550–556.
188. Walton JN, MacEntee MI, Glick N. One-year prosthetic outcomes with implant overdentures: A randomized clinical trial. *Int J Oral Maxillofac Implants* 2002;17:391–398.
189. Melas F, Marcenes W, Wright PS. Oral health impact on daily performance in patients with implant-stabilized overdentures and patients with conventional complete dentures. *Int J Oral Maxillofac Implants* 2001;16:700–712.
190. Peltola MK, Raustia AM, Salonen MA. Effect of complete denture renewal on oral health—A survey of 42 patients. *J Oral Rehabil* 1997;24:419–425.
191. Pera P, Bassi F, Schierano G, Appendino P, Preti G. Implant anchored complete mandibular denture: Evaluation of masticatory efficiency, oral function and degree of satisfaction. *J Oral Rehabil* 1998;25:462–467.
192. Sato Y, Hamada S, Akagawa Y, Tsuga K. A method for quantifying overall satisfaction of complete denture patients. *J Oral Rehabil* 2000;27:952–957.
193. Yi SW, Carlsson GE, Ericsson I, Kim CK. Patient evaluation of treatment with fixed implant-supported partial dentures. *J Oral Rehabil* 2001;28:998–1002.
194. Geertman ME, Boerrigter EM, van't Hof MA, et al. Two-center clinical trial of implant-retained mandibular overdentures versus complete dentures—Chewing ability. *Community Dent Oral Epidemiol* 1996;24:79–84.
195. Humphris GM, Healey T, Howell RA, Cawood J. The psychological impact of implant-retained mandibular prostheses: A cross-sectional study. *Int J Oral Maxillofac Implants* 1995;10:437–444.
196. Wismeijer D, Vermeeren JIJF, van Waas MAJ. Patient satisfaction with overdentures supported by one-stage TPS implants. *Int J Oral Maxillofac Implants* 1992;7:51–55.
197. Kent G, Johns R. Effects of osseointegrated implants on psychological and social well-being: A comparison with replacement removable prostheses. *Int J Oral Maxillofac Implants* 1994;9:103–106.
198. Vermeylen K, Collaert B, Lindén U, Bjorn AL, de Bruyn H. Patient satisfaction and quality of single-tooth restorations. *Clin Oral Implants Res* 2003;14:119–124.
199. Heydecke G, Boudrias P, Awad MA, de Albuquerque RF, Lund JP, Feine JS. Within-subject comparisons of maxillary fixed and removable implant prostheses. *Clin Oral Implants Res* 2003;14:125–130.
200. Meijer HJ, Geertman ME, Raghoebar GM, Kwakman JM. Implant-retained mandibular overdentures: 6-year results of a multicenter clinical trial on 3 different implant systems. *J Oral Maxillofac Surg* 2001;59:1260–1268.
201. Allen PF, McMillan AS, Walshaw D. A patient-based assessment of implant-stabilized and conventional complete dentures. *J Prosthet Dent* 2001;85:141–147.
202. Kapur KK, Garrett NR, Hamada MO, et al. A randomized clinical trial comparing the efficacy of mandibular implant-supported overdentures and conventional dentures in diabetic patients. Part I: Methodology and clinical outcomes. *J Prosthet Dent* 1998;79:555–569.

203. Naert I, Gizani S, van Steenberghe D. Rigidly splinted implants in the resorbed maxilla to retain a hinging overdenture: A series of clinical reports for up to 4 years. *J Prosthet Dent* 1998;79:156–164.
204. de Baat C, van Aken AA, Mulder J, Kalk W. “Prosthetic condition” and patients’ judgment of complete dentures. *J Prosthet Dent* 1997;78:472–478.
205. Garrett NR, Kapur KK, Perez P. Effects of improvements of poorly fitting dentures and new dentures on patient satisfaction. *J Prosthet Dent* 1996;76:403–413.
206. Karabuda C, Tosun T, Ermis E, Ozdemir T. Comparison of 2 retentive systems for implant-supported overdentures: Soft tissue management and evaluation of patient satisfaction. *J Periodontol* 2002;73:1067–1070.
207. Stellingsma C, Raghoobar GM, Meijer HJ, Batenburg RH. Reconstruction of the extremely resorbed mandible with interposed bone grafts and placement of endosseous implants. A preliminary report on outcome of treatment and patients’ satisfaction. *Br J Oral Maxillofac Surg* 1998;36:290–295.
208. Inglehart M, Bagramian R. Oral health related quality of life: An introduction. In: *Oral Health Related Quality of Life*. Chicago: Quintessence, 2002:13–28.

Literature Abstract

Effect of implant healing time on crestal bone loss of a controlled-load dental implant.

A successful implant treatment outcome requires that osseointegration be achieved and cervical bone height maintained. This study hypothesized that early application of a mechanical stimulus (decreased implant healing time) leads to increased bone formation and decreased crestal bone loss. The study design had internal controls, which assessed the healing bone’s condition before loading, and external controls, which assessed the bone after loading. This design permits the following comparisons to be made: (1) loading vs no loading, comparing bone adaptation at the end of the implant period; (2) implant healing time (1, 2, or 4 months); and (3) length of implant healing time. An intraoral hydraulic device was used to control in vivo load and healing time quantitatively. There was a significant difference between loading and nonloading for 4 months of healing ($P = .008$), but not for 1 month ($P = .900$) or 2 months ($P = .360$). Crestal bone loss during loading for the 1-month healing group was slightly larger than for the unloaded controls. The 2- and 4-month groups had 2 times and 4 times as much bone loss as the external controls, respectively. The crestal bone of the loaded 1-month healing implants was radiographically denser and more opaque than in the other groups, indicating that loading at 1 month stimulates bone formation more effectively. Trabeculae appeared to orient along the long axis of the implant, matching the direction of loading, suggesting the adaptation occurred in response to the early loading. The tendency to such an adaptation pattern under functional loading decreased as the healing time increased. Mean elastic moduli were 7.3 GPa, 7.9 GPa, and 8.4 GPa for the 1-, 2-, and 4-month groups, respectively; consequently, early-healing bone is more compliant under functional loading. Loading and bioactivities of osteoblasts exert a synergistic effect on osseointegration that likely supports the hypothesis that early loading produces more favorable osseointegration.

Ko CC, Douglas WH, DeLong R, et al. *J Dent Res* 2003;82:585–591. **References:** 30. **Reprints:** Dr C. C. Ko, Minnesota Dental Research for Biomaterials and Biomechanics, Graduate School, University of Minnesota, Minneapolis, Minnesota 55455. e-mail: koxxx007@unm.ed —Myung W. Brian Chang, Lincoln, Nebraska

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.