

Patient Self-reported Satisfaction with Maxillary Anterior Dental Implant Treatment

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Purpose: Dental implants are accepted as a successful alternative to conventional fixed and removable prostheses for the treatment of partial or complete edentulism. However, there have been few studies of the success of implants from the patients' perspective. The purpose of this study was to assess patient overall satisfaction with the outcome of treatment with maxillary anterior implants.

Materials and Methods: A self-administered mailed questionnaire, which was developed for this project, and a data abstraction form, which was designed based on information available from the corresponding dental records of 123 eligible subjects, were utilized to survey implant patients. **Results:** Seventy-eight of 123 eligible subjects responded to the mailed, self-administered, structured questionnaire. Twelve of the 24 questionnaire variables demonstrated statistically significant bivariate associations with the dependent variable "overall patient satisfaction." Five variables—implant position, definitive restoration shape, appearance, effect on speech, and chewing capacity—were strongly associated with overall satisfaction. No demographic or treatment-related, dental record-abstracted variable, of the 25 that were examined, was statistically significant. **Discussion:** The practitioner who provides implant restorations should be aware of the multidimensional aspects of patient satisfaction with implant treatment. This study suggests that patient satisfaction with key elements influences the overall acceptance of maxillary anterior implant prostheses, which are esthetically critical. Communication between dentist and patient is important to achieve optimal results that will be satisfactory to both. Discussion of treatment limitations may also help patients to develop realistic expectations of the final result. **Conclusions:** In this limited investigation, patient satisfaction with implant position, restoration shape, overall appearance, effect on speech, and chewing capacity were critical for patient overall acceptance of the dental implant treatment. (*Int J Oral Maxillofac Implants* 2003;18:113–120)

Key words: dental esthetics, dental implants, patient satisfaction, questionnaires

Dental implants are accepted as a successful alternative to conventional fixed and removable prostheses and have been demonstrated to be

predictable and moderately trouble-free for the treatment of partial and complete edentulism, as judged by clinicians from a biologic standpoint.^{1–9} The impact of dental implant treatment on patient quality of life (QOL) has been discussed in the literature.^{10–13} It has been stated that it is important to use QOL measures, particularly when the conditions that are being studied are not life threatening and the treatment options may vary.¹⁰ A report regarding the proceedings of the Toronto Symposium (1998) concluded that patient satisfaction outcome measures should be included in future implant success criteria,⁹ highlighting the importance of the patient's perspective in clinical practice.

Patient-based assessments of treatment outcomes have been reported for complete dentures.^{14–16} Examples include the evaluation of patient satisfaction with complete dentures and masticatory performance^{14–16} and patient assessment of the perceived benefit from using dental implants to improve support and retention of complete dentures.^{17–26}

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Few surveys have been conducted regarding patient satisfaction with dental implant treatment in reference to maxillary fixed restorations.²⁷⁻³⁰ Carlson and Carlson²⁹ reported findings from a survey conducted during clinical recalls, indicating that 17% of those patients were dissatisfied with their implant prostheses and that one third of this dissatisfaction was attributed to esthetic problems. Only 1 study³⁰ (n = 39 patients) has investigated patient satisfaction specifically related to maxillary anterior teeth; this study compared patients' and specialists' opinions regarding esthetic results and reported that patients and prosthodontists disagree as to what each group considers important in achieving optimal esthetic results.

Satisfaction with the esthetic result is an important determinant of patient overall satisfaction with dental implant treatment.^{11,29} The most obvious area by which to judge esthetics is the maxillary anterior region, because it is particularly visible to the patient and others. Since the criteria for assessing the quality of the esthetic result are subjective, it is imperative to inquire about the patients' opinion, which may differ from that of the clinician, so as to ensure patient satisfaction³¹ with the final outcome.

The purpose of this study was to examine whether there is an association between overall satisfaction with dental implant treatment and: (1) patient perceptions of selected technical aspects of treatment outcome, (2) patient perceptions of treatment experience, (3) clinical variables related to dental implant treatment, and (4) patient demographic characteristics.

MATERIALS AND METHODS

Study Design

This cross-sectional study examined the association between overall satisfaction of patients treated with dental implants for the replacement of maxillary anterior teeth and treatment- and patient-related factors. An instrument was developed in this project to survey patients who had been treated with dental implants. This survey instrument (self-administered, structured, mailed questionnaire) and data abstracted from the corresponding patients' dental records were utilized to assess patients' overall satisfaction with maxillary dental implant treatment. The self-administered mailed questionnaire and dental record data abstraction form consisted of 24 and 25 items, respectively. Bivariate analysis was utilized to assess the association between the subjects' overall satisfaction with the dental implant treatment questionnaire and dental record-abstracted variables. The research protocol was reviewed and

approved by the University of Connecticut Health Center (UHC) Institutional Review Board.

Sample Selection

The study population consisted of all patients who had been treated with at least 1 dental implant in the area of teeth 4 to 13 (maxillary incisors, canines, and premolars), by the UHC Prosthodontic and Advanced Education in General Dentistry residents and prosthodontic faculty, during the period January 1988 to July 2000. Those patients whose definitive restoration was completed and functional at the time of subject recruitment (May to August 2000) were included in this study. Patients treated by the investigators of this study were excluded from the study. Eligible patients were identified from the UHC dental finance computerized records by corresponding procedure codes associated with implant surgical and prosthodontic treatment and then verified by dental record documentation as to meeting the inclusion criteria.

Questionnaire and Record Abstraction

A 24-item, self-administered, structured multiple-response questionnaire was developed to serve as the instrument for this survey. The questionnaire covered the subjects' overall satisfaction with their dental implant treatment, their perception of various technical aspects of their implant restoration, and specific aspects of treatment and the definitive prosthesis. Examples of survey questions included such items as: were cost and time until completion of treatment reasonable; did the patient like the treating doctor; did the patient think they experienced complications; and inquiries about selected demographic information. The subjects rated their satisfaction on a 4-point Likert scale for each item (1 = "Highly Dissatisfied" to 4 = "Highly Satisfied" or 1 = "Strongly Disagree" to 4 = "Strongly Agree").

All subjects were given specific instructions to evaluate and answer the survey relative to only 1 implant restoration in their mouth—ie, the implant that had the most anterior (mesial) position, regardless of other existing implant restorations.

Eligible patients (n = 123) were subsequently mailed: (1) an introductory letter from the Director of the Graduate Prosthodontic Program; and (2) a package, which included a cover letter, the questionnaire itself, and a return-addressed, stamped envelope. A second survey package was sent to the initial non-respondents (cover letter, questionnaire, and return-addressed, stamped envelope).

Dental Record Data Abstraction

Data abstraction from dental records (25 items) of all eligible patients (n = 123) was conducted blind to

the questionnaire data by one of the investigators. The abstraction included information regarding the patients' dental and medical history, demographic data, and details about the dental implant treatment itself (eg, type of implant placed and whether a grafting procedure was performed).

Statistical Analyses

The dental record and the questionnaire data were double-entered in Epi Info version 6.04 (US Center for Disease Control and Prevention). Statistical analyses utilized SPSS version 10.1 software (SPSS, Chicago, IL). Overall patient satisfaction was considered the dependent variable, and the independent variables were the dental record–abstracted data (25 variables) and the questionnaire responses on specific questions, other than “overall satisfaction” (23 variables).

1. Descriptive statistics of demographic data were tested for a statistical difference between subjects and nonparticipants.
2. Frequencies were obtained to describe the response distribution of questionnaire and the dental record abstracted items.
3. Most variables were dichotomized, and the Fisher exact test for categorical variables or *t* test for continuous variables was used to test bivariate associations with the overall satisfaction variable. Bivariate odds ratios (ORs) and confidence intervals (CIs) were produced by logistic regression for the variables shown to be statistically significant at a level of $P \leq .05$.

RESULTS

The first questionnaire mailing produced a 50% response ($n = 62$), with the second mailing bringing the response to 63% ($n = 78$); however, 2 subjects failed to complete all questions. Sixty-seven (88.2%) of the subjects answered the overall satisfaction question with the highest possible response (“highly satisfied”), 8 (10.5%) were “somewhat satisfied,” and 1 (1.3%) was “somewhat dissatisfied.”

The subjects' mean age was 56 years old, ranging from 18 to 80 years. Fifty-two percent of the subjects were women and 47% were men. Forty-five (58%) of the sample were married and 32 (42%) were not currently married. This sample was highly educated; 78% of the subjects had at least some college education. Thirty subjects (45%) had an annual income above \$50,000 (Table 1).

Eighty-eight percent of the subjects answered the overall satisfaction question with the highest

Table 1 Demographic Characteristics of Implant Satisfaction Survey Subjects ($n = 78$)

Variable	Frequency (%)
Age ($n = 78$)	
35 and under	8 (10.2)
36–45	13 (16.6)
46–55	13 (16.6)
56–65	20 (25.6)
Over 65	24 (30.7)
Gender ($n = 78$)	
Male	37 (47.4)
Female	41 (52.5)
Marital status ($n = 77$)	
Single	19 (24.7)
Divorced	9 (11.7)
Widowed	4 (5.2)
Married	45 (58.4)
Education level ($n = 76$)	
Eighth grade or less	3 (3.9)
Some high school	1 (1.3)
Graduated high school	12 (15.8)
Some college	21 (27.6)
Graduated college	20 (26.3)
More than college	19 (25.0)
Annual income ($n = 65$)	
Less than \$10,000	5 (7.5)
\$10,000–25,000	11 (16.4)
\$25,000–50,000	19 (28.4)
\$50,000–100,000	19 (28.4)
\$100,000 or more	11 (16.4)

possible favorable response. Given this response distribution, it was decided to dichotomize the dependent variable into 2 groups, “highly” and “less than highly” satisfied, by aggregating the 3 “less than highly” satisfied potential responses. The questionnaire and dental record–abstracted variables likewise had a generally skewed distribution, with the highest frequencies in the more favorable categories, and they also were dichotomized on their highest and less than highest levels.

Table 2 presents data abstracted from dental records, comparing study subjects to questionnaire nonrespondents for selected variables. “Relation of treatment to chief complaint” approached statistical significance ($P = .06$). No other variable was statistically significant at the .05 level. The chief complaint of each patient was recorded from an existing form, which had been completed prior to the beginning of the treatment, and the judgment was made blind to participation status (by AL) as to whether the dental implant treatment was related to the chief complaint.

Table 2 Comparison of Eligible Nonparticipants and Subjects of Implant Satisfaction Survey

Variable	Nonparticipants	Subjects	P value
Mean age	53.34	56.13	.31*
Gender			.710**
Male	19	37	
Female	25	42	
Complications [†]			1.000**
No	35	66	
Yes	9	13	
Previous implant failure			.758**
No	19	39	
Yes	1	1	
Relation of treatment to chief complaint			.06**
No	21	29	
Yes	21	50	
Mean length of treatment (days)	480	440	.408*

* *t* test; **Fisher exact test.

[†]As reported in progress notes (examples include abutment or occlusal screw loosening or fracture, anesthesia or paresthesia, and infection). The chief complaint of the patients was recorded from an existing form, which had been completed prior to the beginning of the treatment, and the judgment was made (by AL) as to whether it was relevant to the dental implant treatment.

Fisher exact test and *t* test analyses were utilized to examine the relationships between dichotomized overall satisfaction and questionnaire and data abstraction variables. Neither the demographic (age, gender, marital status, educational level, income) nor any other variables abstracted from the dental records (type, length, or diameter of implant; smoking habits; history of psychologic disorder; complications) were statistically significant, although the type of provisional restoration tested at $P = .074$.

For the questionnaire variables, implant restoration color was the only "esthetic" variable specific to the implant restoration that was not related bivariate to overall satisfaction ($P = 1.000$). The questionnaire variables describing satisfaction with the appearance of the soft tissues around the dental implant, oral health, cost, and time until completion of treatment and factors such as "who influenced your decision to select dental implant treatment" were not significantly related to overall satisfaction. "Cost" approached statistical significance ($P = .056$).

Twelve questionnaire variables demonstrated bivariate associations at a significant level of $P \leq .05$. The significant variables were: (1) satisfaction with appearance (4 variables), (2) function (3 variables), (3) satisfaction with the treating doctor, (4) information about the procedure and outcome prior to treatment, (5) presence of complications, and (6) willingness to redo or recommend the procedure (2

Table 3 Bivariate Odds Ratios (ORs) and Confidence Intervals (CIs) of Questionnaire Variables That Were Related to Patient Overall Satisfaction*

Variable	OR	95% CI	P value
Shape	55.1	8.5–357	$\leq .001$
Position	113.7	13.7–937.4	$\leq .001$
Appearance when smiling	35.5	5.9–211.2	$\leq .001$
Comparison with natural teeth	5.8	1.1–30.4	$\leq .036$
Speech	51.9	4.8–557.6	$\leq .001$
Chewing capacity	20.0	3.9–101	$\leq .001$
Comfort	16.7	2.9–96.8	$\leq .002$
Complications	14.2	2.9–68.5	$\leq .001$
Information prior to treatment	10.7	2.0–56.9	$\leq .005$
Would redo treatment	24.4	2.8–210.6	$\leq .004$
Would recommend treatment	26.6	3.0–230	$\leq .003$
Satisfaction with doctor	10.3	2.2–47.8	$\leq .003$

*As determined initially by Fisher exact test at a statistically significant level ($P \leq .05$).

variables). Logistic regression was conducted to assess the strength of association for these variables. The bivariate ORs and CIs of those variables are presented in Table 3. These point estimates ranged from ORs of 5.8 to 113.7, all with wide confidence intervals, which reflected the small sample size.

The variables (1) position of the implant restoration, (2) shape of the implant restoration, (3) appearance when smiling, (4) speech, and (5) chewing capacity demonstrated strong associations with the patients' self-reported overall satisfaction. It is important to note the instability of the point estimates, which is clearly demonstrated by the wide confidence intervals. However, the lower 95% confidence bound for each of these is greater than 3, which indicates a strong association.

These results suggest that patients who were highly satisfied with the position of their implant-supported restoration were 113 times more likely to be highly satisfied with their overall treatment (OR = 113), compared to patients who were less than highly satisfied with their implant position. Similarly, patients who were highly satisfied with their chewing capacity were 20 times more likely to be highly satisfied with their overall treatment (OR = 20), compared to patients who were less than highly satisfied with this variable.

The reliability of the questionnaire was assessed using the Cronbach alpha coefficient,^{32,33} which was

Table 4 2 By 2 Table of Variables Having a Large Proportion of Less Than “Highly Satisfied” Responses

Variable	Response	Overall satisfaction		P value*
		“Highly Satisfied”	Less than “Highly Satisfied”	
Questionnaire variable				
Cost reasonable	“Strongly Agree”	20	0	.056
	Less than “Strongly Agree”	44	9	
Time until completion of treatment reasonable	“Strongly Agree”	20	1	.268
	Less than “Strongly Agree”	43	8	
Dental record–abstracted variable				
Type of provisional restoration	Partial denture	30	1	.074
	Other	37	8	

*As determined initially by Fisher exact test.

0.827. This estimate reflects a highly acceptable level of internal consistency. The variables included in this reliability analysis were the questionnaire variables (21), which required responses ranging from 1 through 4.

DISCUSSION

Dental implants have demonstrated high success rates, as judged by clinicians, based on biologic and esthetic criteria. However, the importance of evaluating the implant treatment from the patients’ standpoint⁹ so as to assess their acceptance of the treatment outcome has not been adequately recognized in the literature, even though it has been suggested that implant success criteria should include the level of patient acceptance of the implant treatment.⁹ The purpose of this study was to determine whether there is an association between patient overall satisfaction with defined aspects of dental implant treatment. Eighty-eight percent of the subjects of this study were highly satisfied with their implant restoration; this result is in agreement with previous studies.^{29,30,34}

No demographic variables were related to the overall satisfaction at a statistically significant level. These results are in agreement with those of Kiyak and coworkers²⁸ and those of Chang and associates³⁰ in terms of age and gender, but not with those of other studies,^{31,35,36} which have reported that appearance was more important to women and younger patients than to men and older patients.

Questionnaire variables concerning the appearance of the soft tissues around the implant were not significantly related to overall satisfaction, although 50% of the respondents reported dissatisfaction

with the soft tissue–related variables. It is possible that these patients were informed of the potential soft tissue problems and accepted the limitations of the treatment.

“Color” was the characteristic that best predicted the subjective perception of dental attractiveness of a smile, as reported in a survey (n = 297) conducted by Dunn and coworkers.³⁷ The authors were unable to demonstrate a statistically significant association, even at the bivariate level, for the independent variable “color” in this investigation. The reason for this discrepancy of the results concerning the variable “color,” compared with those of previous studies, may have been that the treating doctors in this study were possibly aware of the importance of this factor in patients’ satisfaction and achieved the patients’ optimum “color” preference or ensured the patients’ acceptance of technical limitations.

The subjects of this study appeared dissatisfied with both the cost and the time it took to complete their treatment. However, “time” was not significant, while “cost” approached significance ($P = .056$) (Table 4). These findings may suggest that patients do not find dental implant treatment inexpensive, but patients who proceed with this procedure are more often those who can afford it, making other personal considerations more important in their overall treatment satisfaction.

The type of provisional restoration used by 51% of the subjects before placement of the definitive restoration was an interim-treatment partial denture (Table 4). Subjects who had an interim partial denture tended to be more highly satisfied with their implant restoration, although this was not statistically significant ($P = .074$). This finding may suggest that when patients have had previous removable prosthesis experience to compare their definitive

implant restoration with, the definitive implant restoration may be accepted more favorably.

There is an increasing awareness of the importance of patient-doctor communication in achieving the desired health outcome.³⁸⁻⁴⁰ The difference in proportion of "treatment which addressed the chief complaint" over "chief complaint unrelated to the dental implant treatment" between subjects who answered the survey and nonparticipants (21/21 versus 29/50) had a statistical significance level of .06. This finding may suggest that the nonparticipants may have been encouraged by the treating dentist to receive dental implant treatment, which may not have addressed the patients' primary concern. This possible management failure may have led to some dissatisfaction and subsequent study participation refusal. This finding suggests that it is vital that patient-doctor communication take cognizance of patients' concerns and perceptions, an insight that has also been recognized in the complete denture literature.^{16,41,42}

Communication between dentist and patient is important to achieve optimal esthetic results that will be satisfactory to both, since their perceptions of esthetics do not necessarily coincide.^{30,43} The variable "information received prior to treatment" was related to patient overall satisfaction ($P = .003$), suggesting the importance of discussing treatment limitations that may apply, so that patients can have realistic expectations of each treatment phase. Consideration of patients' concerns and perceptions and obtaining patient approval of the final result, by means of a diagnostic waxup during the initial treatment planning phase, as well as maintenance of communication throughout treatment, may increase the likelihood of successful outcomes.

Two thirds of the subjects of this study strongly agreed with the statement that they would be willing to undergo the same treatment and would highly recommend it to a friend. These results seem to be in conflict with the responses regarding the overall satisfaction (89%). It would be interesting to further investigate the underlying reason why 89% of the subjects report highly favorable responses on their overall satisfaction, but only 67% would be willing to repeat the treatment. These results were slightly lower than those of a previous study,³⁴ which reported that 77% would redo and 85% would recommend to others their dental implant treatment.

The 5 variables that were of primary importance in the patients' ultimate satisfaction with the overall dental implant treatment were (1) implant position, (2) restoration shape, (3) appearance when smiling, (4) effect on speech, and (5) chewing

capacity (Table 3), as suggested by the magnitude of their ORs. The first 3 variables represent overall appearance, and the last 2 reflect upon function. Hawkins and associates⁴⁴ found patients' satisfaction with maxillary anterior fixed restorations to be higher in patients with class I than class II or III ridges, according to the classification of Siebert.⁴⁵ They concluded that ridge augmentation should be considered prior to the fabrication of maxillary anterior fixed prostheses, particularly when class II or III defects are present. The presence of adequate ridge height and width is essential for placement of implants to obtain proper position and contour (shape) of the definitive implant restoration. The direction and extent of resorption in the maxilla often result in situations where it is necessary to utilize augmentation procedures to correct implant site ridge defects. Restorative dentists have recognized the importance of properly positioned dental implants and the necessity for using a surgical guide to ensure appropriate surgical placement. In contemporary implant dentistry, the position of the bone should not dictate implant placement, as it may have previously. Several surgical techniques are available to augment the implant site when ridge height or width is inadequate. Attention to this aspect of rehabilitation may positively influence patient overall acceptance of the dental implant treatment.

The self-administered, mailed questionnaire of this study did not include questions that addressed QOL issues. However, patients' attention to the restoration of function—namely, "speech" and "chewing capacity"—of the definitive implant restoration indicates that future dental implant research should be designed toward refining the study instrument to consider the effect of dental implant treatment on patient QOL.

There are several limitations to this study. The sample size was small ($n = 78$), the selected patients were all treated at the UCHC, and the distribution of subject responses was limited. Variables that were not shown to be statistically significant may have demonstrated significance with a larger sample size. Only 11.8% of the respondents reported "negative" outcomes (less than "Highly Satisfied"), which limited the ability to detect any significant difference. Some questions were retrospective and relied on subjects' memory and may have introduced an associated recall bias. Data collected through the self-administered questionnaire were subject to possible misinterpretations of the questions by the subjects; and finally, income categories in the questionnaire overlapped by double-listing of income transitions.

CONCLUSION

This study is in general agreement with previous reports on patient satisfaction with dental implant treatment. The results of this study suggest that patient satisfaction with implant position, restoration shape, and overall appearance, as well as effect on speech and chewing capacity, is critical for patient overall acceptance of the treatment. Practitioners who provide implant restorations should be aware of the multidimensional aspects of patients' satisfaction with their implant treatment, giving particular attention to patient acceptance of dental implant ability to restore esthetics (position, shape, overall appearance) and function (effect on speech and chewing capacity). Two-way patient-doctor communication prior to and throughout treatment affects patient perception of success of the implant outcome. Future studies of different populations with larger sample sizes are necessary to support the conclusions and generalize the results of this study.

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