

AICRG, PART IV: PATIENT SATISFACTION REPORTED FOR ANKYLOS IMPLANT PROSTHESES

Harold F. Morris, DDS, MS
Shigeru Ochi, PhD
Arthur Rodriguez, DDS, MS
Paul M. Lambert, DDS

KEY WORDS

Dental implants
Osseointegration
Clinical studies
Patient satisfaction

Harold F. Morris, DDS, MS, is codirector of the Dental Clinical Research Center (DCRC) and project codirector of the Ankylos Implant Clinical Research Group (AICRG), Department of Veterans Affairs Medical Center (VAMC), Ann Arbor, Mich. Correspondence should be addressed to Dr Morris at the DCRC (154), VA Medical Center, 2215 Fuller Road, Ann Arbor, MI 48105.

Shigeru Ochi, PhD, is codirector of the DCRC and project codirector of the AICRG, VAMC, Ann Arbor, Mich.

Arthur Rodriguez, DDS, MS, is staff prosthodontist at the VAMC, Pittsburgh, Penn, and at the University of Pittsburgh School of Dental Medicine, Pittsburgh, Penn.

Paul M. Lambert, DDS, is chief of the Dental Service, VAMC, Dayton, Ohio; assistant professor, Department of Community Dentistry, Ohio State University, College of Dentistry, Columbus, Ohio; and associated clinical professor, Department of Surgery, Wright State University, School of Medicine, Dayton, Ohio.

Problem: Although many maxillary dentures exhibit sufficient retention and stability for patients to adapt well to them, mandibular dentures present a major challenge. The introduction of the endosseous dental implant provided the opportunity for the patient to have esthetic replacements (implant prostheses) that were retentive and stable for all missing natural teeth. **Method:** This paper reports on the satisfaction of over 470 patients with implant prostheses fabricated using a new and innovative implant design (Ankylos, Dentsply-Friadent, Mannheim, Germany). **Results:** A total of 1500 Ankylos implants were placed, restored, and followed for 3 to 5 years. Patients were asked to respond to a series of questions related to their satisfaction with their new replacements for missing natural teeth. A total of 95.6% of the patients rated chewing ability with Ankylos prosthesis as excellent to good; 92.2% indicated a significant improvement in their ability to chew; 92.6% reported overall clinical function much better than conventional dentures; 99.1% indicated that speech had improved or was not changed; 96.3% indicated hot and cold foods tasted better; 98.8% indicated no pain or discomfort during clinical function; 99.4% liked their new implant prosthesis; 98.0% would seek implant-prostheses treatment again, if necessary; 99.1% would recommend implant prostheses to friends and relatives; and 98.8% indicated the advantages of Ankylos prostheses far exceeded any disadvantages that may exist. **Conclusions:** Patients indicated that they (1) were highly satisfied with the final results of the replacements for their natural teeth that were retained or supported by this new implant design, (2) would not hesitate to recommend this form of treatment to their friends and relatives, and (3) would not hesitate to seek the same treatment again if necessary in the future.

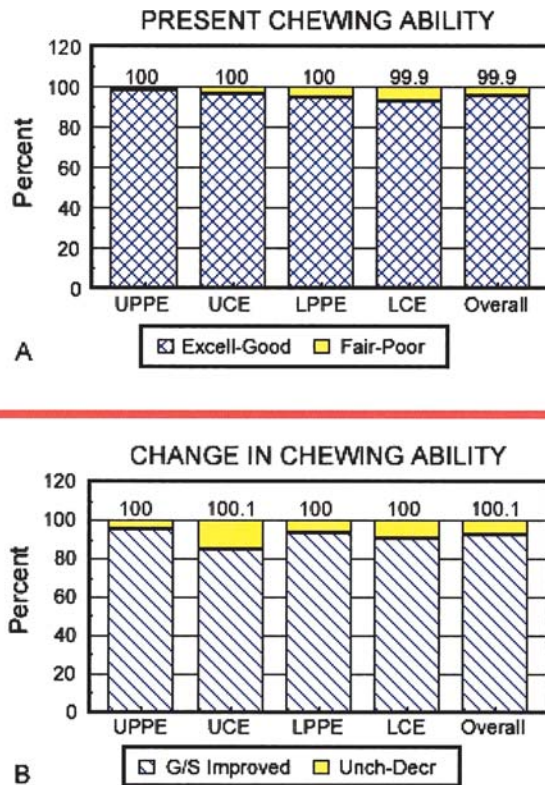


FIGURE 1. (A) Comparison of current chewing ability with the Ankylos prosthesis. In general there was a vast improvement in chewing ability with the new implant prosthesis. (B) Comparison of any improvement in chewing ability with the new Ankylos prosthesis. In general the data suggested that the patients experienced an overall improvement in chewing. UPPE indicates maxillary posterior partially edentulous cases; UCE, maxillary completely edentulous cases; LPPE, mandibular posterior partially edentulous cases; LCE, mandibular completely edentulous cases; Overall, all types of implant prosthesis cases.

BACKGROUND

Prior to the introduction of the endosseous dental implant to dentistry, patients who lost all or a few of their natural teeth were provided a variety of dental prostheses. Satisfaction with these replacements varied widely. Some patients with conventional complete maxillary dentures exhibited retention and stability that was sufficient to allow them to adapt to the limitations of this type of prosthesis. In some cases they quickly adapted and learned to function well with them. Satisfaction was generally much lower,

in most cases, for those patients with mandibular dentures because of a lack of retention and stability. Complaints of difficulties with eating and speaking were common. To attempt to overcome some of the limitations of conventional dentures, patients tended to select their foods based on its texture.¹ As patients age, the height and width of the edentulous ridge generally decreases, which further reduces denture retention, stability, and overall satisfaction.

For patients with some natural teeth remaining, removable partial dentures provide better stability and less frustration. Although cast metal frames provide rigidity

and flexible clasps provide retention and stability during clinical function, some patients express concern with removable partial dentures, believing that the metal clasps will damage their teeth and eventually cause the natural teeth to decay. Still others complain that removable partial dentures are simply too bulky and refuse to wear them. In spite of the improved stability and retention of removable partial denture prostheses, patients continue to demand natural-appearing esthetic replacements for missing natural teeth that have the same qualities as their natural teeth. Therefore, as with any new form of dental treatment, satisfaction with replacements for missing natural teeth is important to both the patient and the treating dentist.

Clearly, implant-supported or retained replacements for missing natural teeth have the potential to meet these requirements. Patients satisfied with the results of their implant prosthesis will recommend this form of treatment to both friends and relatives. If they are not satisfied, patients may withhold payment or seek legal advice to explore options of getting their money returned. These patients will not recommend the replacements to anyone. Therefore, assessing patient satisfaction is of vital importance to the dental profession, which must remain acutely aware of their concerns during each patient's individual treatment each day.

With the introduction of the endosseous dental implant, dentistry entered a new era in which the previous problems of stability and retention of conventional dental replacements could be resolved. Patients soon became aware that implant prostheses were considerably more stable, chewing efficiency was improved

TABLE 1
Comparison of current chewing ability following implant-prosthesis placement*

Jaw Regions	Excellent/Good (%)	Fair (%)	Poor (%)
UPPE	98.5	1.5	—
UCE	96.6	3.4	—
LPPE	94.8	2.9	2.3
LCE	93.3	2.2	4.4
Total	95.6	2.6	1.7

*The total is the overall assessment of chewing for all prosthodontic applications. UPPE indicates maxillary posterior partially edentulous cases; UCE, maxillary completely edentulous cases; LPPE, mandibular posterior partially edentulous cases; LCE, mandibular completely edentulous cases.

greatly,² talking was easier, cleaning of the restoration was as easy as brushing their natural teeth,³ and their appearance was dramatically improved. All of these combined advantages contributed to significantly improving patients' quality of life. As a result, the number of patients requesting that implants be used in the fabrication of new dental prostheses has increased.^{4,5} Today, patient satisfaction with implant prostheses is high,⁶⁻⁸ even in patients who had to have bone grafts in an effort to provide adequate amounts of bone to allow the placement of implants.

The original endosseous dental implant has undergone numerous design improvements since its introduction to dentistry. New implant companies were organized to meet the increased demand for implants, and each implant company quickly developed a variety of design and material modifications. In recent years a new and innovative implant design (Ankylos, Friadent GmbH, Mannheim, Germany) has been developed,⁹ which immediately gained widespread acceptance in Europe and Asia. This new implant will be available in the United States in early 2004.

TABLE 2
Comparison of change in chewing ability after new implant prostheses*

Jaw Regions	Greatly/Slightly Improved (%)	Unchanged (%)	Decreased (%)
UPPE	95.5	4.5	—
UCE	84.8	15.3	—
LPPE	93.7	4.6	1.7
LCE	91.1	6.7	2.2
Total	92.2	6.7	1.2

*The total is the overall assessment for all prosthodontic applications. UPPE indicates maxillary posterior partially edentulous cases; UCE, maxillary completely edentulous cases; LPPE, mandibular posterior partially edentulous cases; LCE, mandibular completely edentulous cases.

What makes the Ankylos implant design different from other designs available in the United States is that it features a progressive thread design with a roughened surface, a tapered abutment connection, and a highly polished

collar that does not have threads on its surface. Collectively, these design features direct the stresses developed during clinical function away from the crestal bone and into the trabecular bone. Crestal bone exhibits strong

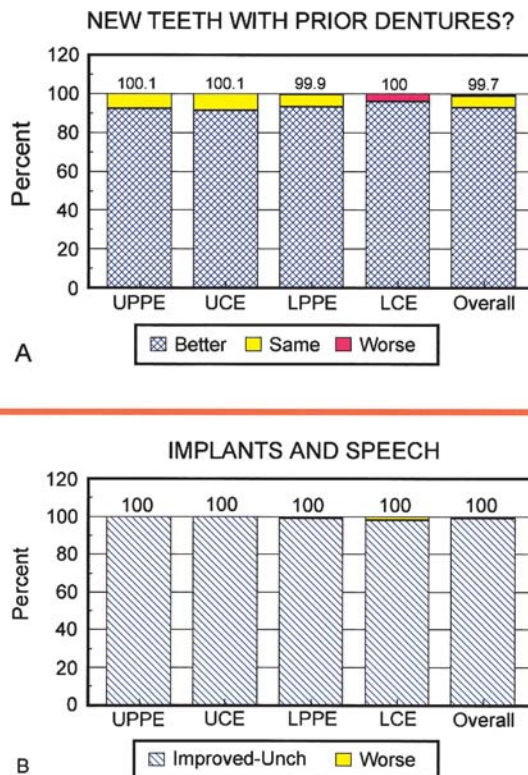


FIGURE 2. (A) Comparison of overall clinical function with the new Ankylos prosthesis compared with other replacements for missing teeth. In general, the new implant prostheses were found to provide a noticeable improvement in clinical function over all other dentures. (B) Comparison of improvement in speech with the new Ankylos prosthesis. Almost 100% of the patients felt that their new implant prostheses significantly improved their speech. UPPE indicates maxillary posterior partially edentulous cases; UCE, maxillary completely edentulous cases; LPPE, mandibular posterior partially edentulous cases; LCE, mandibular completely edentulous cases; Overall, all implant prostheses or types of prosthodontic applications.

TABLE 3

Overall comparison of clinical function of Ankylos prosthesis with other replacements for missing natural teeth (comparison of "new teeth" with "old teeth" after new implant prosthesis)*

Jaw Regions	Much/Slightly Better (%)	Same/Unchanged (%)	Decreased (%)
UPPE	92	8.1	—
UCE	91.3	8.8	—
LPPE	93.1	6.2	0.6
LCE	95.6	—	4.4
Total	92.6	6.2	0.9

*The total is the overall assessment for all prosthodontic applications. UPPE indicates maxillary posterior partially edentulous cases; UCE, maxillary completely edentulous cases; LPPE, mandibular posterior partially edentulous cases; LCE, mandibular completely edentulous cases.

properties, but if damaged it repairs slowly. Trabecular bone, on the other hand, is more resilient, and if damaged repairs more rapidly. The tapered abutment connection has been shown by Chou et al¹⁰ to minimize crestal bone loss.

PURPOSE

The purpose of the analysis of patient satisfaction from the large Ankylos Implant Clinical Research Group's (AICRG) database was to assess the degree of satisfaction that patients exhibited following the replacement of their missing natural teeth with implant prostheses that are retained or supported by the new Ankylos implant.

METHODS

A total of 34 research centers and over 80 clinical investigators were involved in the conduct of this AICRG effectiveness-type study.¹¹ One of the principle features of an effectiveness clinical study of endosseous dental implants is the large number of patients from different populations who are treated by dentists with different training backgrounds. The centers selected for this international clinical study included 30 VA

Medical Centers, 2 dental schools in the United States, and 2 dental clinics in Asia. The VA Medical Centers selected were widely dispersed geographically to provide a sample population that was highly representative of the patients who might benefit from implant prosthesis treatments worldwide. This distribution also made it possible to look at potential differences in patient demographics as well as the skill and training of the dental professionals providing the implant prostheses. The inclusion of the 2 US dental schools and the dental clinics in Taiwan and Korea further contributed to the diversification of the patient sample to enhance the global relevance of the final data.¹¹ All professional participants/investigators were trained and standardized as to all of the procedures associated with the placement, restoration, and data collection to be followed during the conduct of the study. This training was conducted over a 2-day period prior to the start of the study.

A total of 1500 Ankylos implants were placed in 478 patients to provide support or retention for 638 implant prostheses. Following an appropriate healing period, dental prostheses were fabricated and inserted, and the

TABLE 4

Comparison of speech after new Ankylos prosthesis*

Jaw Regions	Improved/Unchanged (%)	Decreased (%)
UPPE	100	—
UCE	100	—
LPPE	98.8	1.2
LCE	97.8	2.2
Total	99.1	0.9

*The total is the overall assessment for all prosthodontic applications. UPPE indicates maxillary posterior partially edentulous cases; UCE, maxillary completely edentulous cases; LPPE, mandibular posterior partially edentulous cases; LCE, mandibular completely edentulous cases.

patients were asked to complete a survey related to their satisfaction with the final replacements for their missing natural teeth. The implant prostheses were followed for not less than 3 years and not more than 5 years at the time of this report.

This paper summarizes the patients' responses to the following questions: (1) after the insertion of their implant prostheses, how would they rate their chewing ability; (2) was there an improvement in chewing ability compared with their old conventional dentures; (3) was the overall clinical performance of the new Ankylos prosthesis better than their conventional dentures; (4) were there any noticeable changes in speech; (5) what was their comfort level when eating extremely hot or cold foods; (6) was there any persistent pain following completion of their treatment; (7) do they like their new implant prostheses; (8) would they have the implant prosthesis treatment again if necessary; (9) would they recommend this form of treatment to their friends or relatives; and (10) did the advantages associated with implant prosthesis treatment exceed any disadvantages.

RESULTS AND DISCUSSION

Chewing ability with new Ankylos prosthesis

The responses of the patients regarding their current chewing ability with their new implant prosthesis are summarized in Figure 1A and Table 1. For all restorations placed and followed during the course of the study, 95.6% of the patients indicated that their chewing ability was now excellent to good, 2.6% as fair, and only 1.7% as poor. For the 4 different types (maxillary posterior partially edentulous, maxillary completely edentulous, mandibular posterior partially edentulous, and mandibular completely edentulous) of implant prostheses, the excellent to good ratings ranged from 93.3% for the mandibular completely edentulous cases to 96.6% for the maxillary completely edentulous cases. The patterns of fair or poor responses were generally similar for all prosthetic applications.

Improvement in chewing compared with conventional dentures

The patients' perceptions as to the extent of the improvement in their chewing ability in relation to their old dentures is shown in Figure 1B and Table 2. For all restorations, about 92% of the new implant prostheses were evaluated as representing a great improvement or slight improvement in chewing when compared with the patients' old dentures. Of those remaining, 6.7% indicated that their ability to chew with the new implant prosthesis was unchanged from that of their old dentures, and 1.2% indicated that the implant prostheses were not as good as their previous conventional dentures. These less favorable responses were generally

from patients who had experienced minor complications during the fabrication procedure. There were only slightly different responses noted for the different types of implant prostheses: complete or posterior partially edentulous cases. The 15.3% of the

maxillary completely edentulous cases rated as being similar to the chewing of food that the patient experienced with their previous conventional dentures is not fully unexpected, since patients generally learn to function well with them.

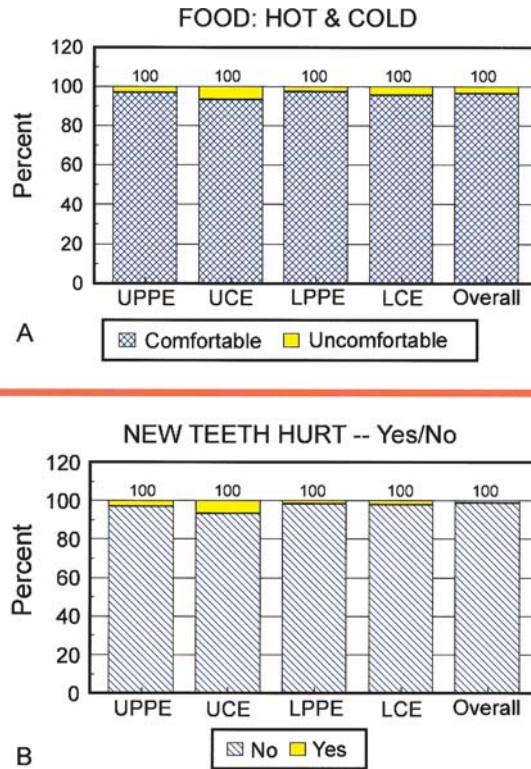


FIGURE 3. (A) Comparison of sensations when eating hot or cold foods after receiving the new Ankylos prosthesis. (B) Comparison of "comfort level" during chewing with the new Ankylos prosthesis. UPPE indicates maxillary posterior partially edentulous cases; UCE, maxillary completely edentulous cases; LPPE, mandibular posterior partially edentulous cases; LCE, mandibular completely edentulous cases; Overall, all implant prostheses or types of prosthodontic applications.

TABLE 5
Comparison of sensation when eating hot or cold food with Ankylos prosthesis*

Jaw Regions	Comfortable (%)	Uncomfortable (%)
UPPE	97.0	3.0
UCE	93.2	6.8
LPPE	97.1	2.9
LCE	95.6	4.4
Total	96.3	3.8

*The total is the overall assessment for all prosthodontic applications. UPPE indicates maxillary posterior partially edentulous cases; UCE, maxillary completely edentulous cases; LPPE, mandibular posterior partially edentulous cases; LCE, mandibular completely edentulous cases.

TABLE 6

Comparison of "comfort level" during chewing with Ankylos prosthesis*

Jaw Regions	Discomfort—NO (%)	Discomfort—YES (%)
UPPE	100	—
UCE	100	—
LPPE	98.3	1.7
LCE	97.8	2.2
Total	98.8	1.2

*The total is the overall assessment for all prosthodontic applications. UPPE indicates maxillary posterior partially edentulous cases; UCE, maxillary completely edentulous cases; LPPE, mandibular posterior partially edentulous cases; LCE, mandibular completely edentulous cases.

Overall clinical function of implant prosthesis with conventional dentures

The overall comparison of clinical function with the implant prostheses with all previous dentures is shown in Figure 2A and Table 3. For all jaw regions, the implant prostheses were rated as being

much or slightly better than all other previous dentures 92.6% of the time, 6.2% were rated as being the same, and only 0.9% were rated as being worse. The responses varied slightly depending on the prosthodontic application. Again, the maxillary implant prostheses had the largest

percentage that indicated that there was no difference between the old conventional denture and the implant prosthesis.

Comparison of speech with new implant prosthesis

The evaluation of the influence of the new Ankylos prostheses on speech is shown in Figure 2B and Table 4. Overall it indicates that in 99.1% of all cases, the new implant prostheses either improved speech or had no effect on the quality of speech, whereas only 0.9% indicated that the quality of speech actually decreased. Similar ratings are evident when each type of prosthesis is considered.

Comfort when eating hot or cold foods

In general, following implant prosthesis placement, patients found that the sensations experienced during eating of either hot or cold food were comfortable. Overall, 96.3% rated the sensations as being comfortable, and only 3.8% reported being uncomfortable. The data is further summarized in Figure 3A and Table 5 for the various prostheses types, but in general they are all very similar.

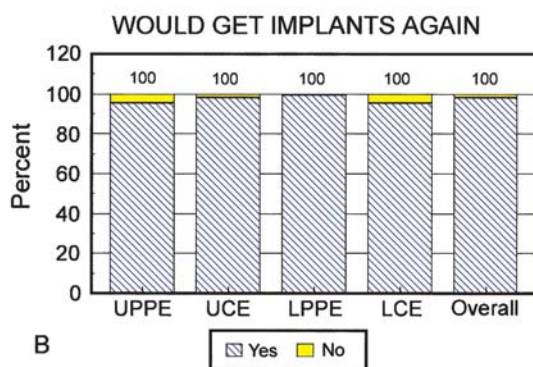
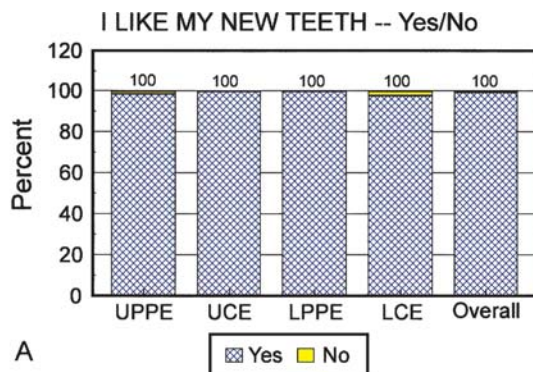


FIGURE 4. (A) Overall satisfaction with the new Ankylos prosthesis. (B) Would you seek an Ankylos prosthesis treatment again, if necessary? UPPE indicates maxillary posterior partially edentulous cases; UCE, maxillary completely edentulous cases; LPPE, mandibular posterior partially edentulous cases; LCE, mandibular completely edentulous cases; Overall, all implant prostheses or types of prosthodontic applications.

Pain or discomfort following insertion of implant prosthesis

The patient's response to the question about the presence of pain or discomfort following the placement of the implant prosthesis is summarized in Figure 3B and Table 6. Overall, 98.8% of the ratings indicated that there was no discomfort associated with the implant prosthesis during clinical function, and only 1.8% indicated that there was some discomfort. The ratings were very similar for the various prosthesis types, with most indicating that there was no

TABLE 7
Satisfaction with Ankylos prosthesis*

Jaw Regions	Like New Prosthesis (%)	Do Not Like New Prosthesis (%)
UPPE	98.5	1.5
UCE	100	—
LPPE	100	—
LCE	97.8	2.2
Total	99.4	0.6

*In general, most patients were highly satisfied with their new replacements for missing natural teeth. The total is the overall assessment for all prosthodontic applications. UPPE indicates maxillary posterior partially edentulous cases; UCE, maxillary completely edentulous cases; LPPE, mandibular posterior partially edentulous cases; LCE, mandibular completely edentulous cases.

discomfort associated with the implant treatment.

Satisfaction with Ankylos prosthesis

The responses to various questions in the survey have been discussed above. The overall satisfaction with the implant prostheses is summarized in Figure 4A and Table 7. The question was, "Do you like your new teeth?" The question was designed for a simple yes/no response. Overall, 99.4% of the patients indicated that they liked their new implant prostheses, and only 0.6% stated that they did not. Again, similar responses were recorded for each implant-prostheses type.

Would you have implant-prosthesis treatment again?

The question focuses on the overall satisfaction of the implant-prosthesis treatment and is 1 of the most important questions that can be asked about a new implant design. The question asked, "Would you have implant-prosthesis treatment again, if neces-

sary?" The question was designed for a yes/no response. The responses are shown in Figure 4B and Table 8. Overall, 98% of the patients provided Ankylos prostheses were very satisfied with the treatment they received and indicated that they would have the treatment again if necessary. A small number (2%), however, indicated that they would not have this type of treatment again. Each of the different implant-prosthesis types elicited similar yes/no responses from the patients.

Would you recommend this treatment to a friend or relative?

The question, "Would you recommend this treatment to a friend or relative?" is another important question that provides valuable insight into the quality of treatment. The overall response was extremely high, with 99.1% responding that they would recommend that their friends and relatives consider this form of implant-prosthesis treatment, whereas very few (0.9%) indicated that they would not suggest that others have this form of treatment (Figure 5A; Table 9). Similar high ratings were recorded for the different implant-prostheses types.

Were advantages of implant-prosthesis treatments greater than disadvantages?

The question, "Did the advantages of implant-prosthesis treatment outweigh any disadvantages that you may have identified during the course of implant treatment?" provides dentistry with an overall indication of the patient's acceptability of all phases of the entire implant-prosthesis process. Overall, 98.9% of the patients indicated that the advantages far outweighed any disad-

TABLE 8
Would patient seek Ankylos-prosthesis treatment again?*

Jaw Regions	Would Seek Implants Again (%)	Would Not Want Implants Again (%)
UPPE	95.5	4.5
UCE	98.3	1.7
LPPE	99.4	0.6
LCE	95.6	4.4
Total	98	2.0

*If necessary, in general, due to the high satisfaction with implant prostheses, almost all patients would seek this treatment again. The total is the overall assessment for all prosthodontic applications. UPPE indicates maxillary posterior partially edentulous cases; UCE, maxillary completely edentulous cases; LPPE, mandibular posterior partially edentulous cases; LCE, mandibular completely edentulous cases.

vantage that was associated with implant-prosthesis treatment, with only 1.2% indicating that this was not the case (Figure 5B; Table 10).

SUMMARY

A total of 1500 Ankylos implants were placed to provide support or retention for dental prostheses replacing missing natural teeth in 478 patients with 638 implant prostheses. The follow-up period varied from 3 to 5 years. Following placement of the implant prosthesis, patients were asked to respond to the series of questions concerning their satisfaction with the Ankylos prosthesis.

In general, patient satisfaction was very high for each of the following questions: (1) current chewing ability with new Ankylos prosthesis; (2) chewing ability compared with conventional dentures; (3) overall clinical function compared with conventional dentures; (4) comparison of speech with new Ankylos prosthesis;

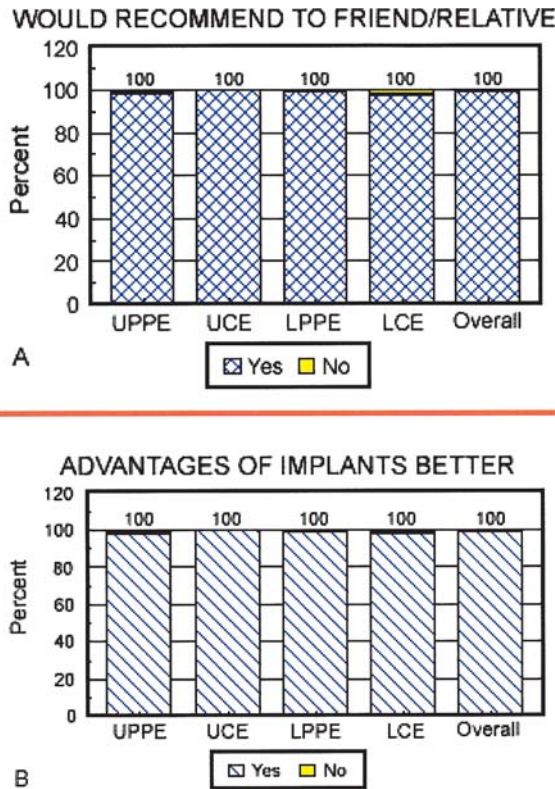


FIGURE 5. (A) Would you recommend an Ankylos prosthesis to your friends and relatives? (B) Were the advantages of the Ankylos prosthesis greater than any disadvantages? UPPE indicates maxillary posterior partially edentulous cases; UCE, maxillary completely edentulous cases; LPPE, mandibular posterior partially edentulous cases; LCE, mandibular completely edentulous cases; Overall, all implant prostheses or types of prosthodontic applications.

(5) comfort when eating hot or cold foods; (6) pain, discomfort, or complications following Ankylos prosthesis placement; (7) satisfaction with Ankylos prosthesis;

(8) Would you have the same treatment again, if necessary? (9) Would you recommend Ankylos-prosthesis treatment for a friend or relative? and (10) Were the

TABLE 10
Comparison of patients who feel that the advantages were much greater than any disadvantages*

Jaw Regions	Yes (%)	No (%)
UPPE	98.5	4.5
UCE	100	—
LPPE	98.9	1.1
LCE	97.8	2.2
Total	98.8	1.2

*The total is the overall assessment of chewing for all prosthodontic applications. UPPE indicates maxillary posterior partially edentulous cases; UCE, maxillary completely edentulous cases; LPPE, mandibular posterior partially edentulous cases; LCE, mandibular completely edentulous cases.

advantages associated with Ankylos-prosthesis treatment greater than any disadvantages encountered. Satisfaction ranged from 100% to around 92% of the patients who were very satisfied with their implant treatment with the Ankylos implant. The patients indicated that 99.1% to 100% would recommend an Ankylos implant prosthesis to their friends and relatives. A similar distribution of patients indicated that they would seek implant prostheses if necessary at some future date.

CONCLUSIONS

The following conclusions can be made:

- Patient satisfaction with the Ankylos prosthesis was very high when compared with conventional dentures.
- Patients with Ankylos prostheses were so satisfied that they would not (1) hesitate to have treatment repeated, (2) would recommend an Ankylos prosthesis to friends and relatives, and (3) felt that the final advantages of the Ankylos prosthesis was much greater than any disadvantages.

TABLE 9
Comparison of patients who would recommend Ankylos-prosthesis treatment to a friend or relative*

Jaw Regions	Would Recommend to Friend/Relative (%)	Would Not Recommend to Friend/Relative (%)
UPPE	98.5	1.5
UCE	100	—
LPPE	99.4	0.6
LCE	97.8	2.2
Total	99.1	0.9

*The total is the overall assessment for all prosthodontic applications. UPPE indicates maxillary posterior partially edentulous cases; UCE, maxillary completely edentulous cases; LPPE, mandibular posterior partially edentulous cases; LCE, mandibular completely edentulous cases.

ACKNOWLEDGMENTS

This investigation was supported by Friadent GmbH, Mannheim, Germany (formerly Degussa-AG, Hanau, Germany). Study investigators often spent time outside of their assigned duties to collect and record data. The authors gratefully acknowledge the dedication and contributions of the current and former clinical investigators:

Ewha Woman's Hospital (South Korea): Jang Woo Choi, DDS, PhD; Myung Rae Kim, DDS, MS, PhD.* Cathay General Hospital (Taiwan): Chin-Sung Chen, DDS; Shyuan-Yow Chen, DDS; Cherng-Tzeh Chou, DDS; Hong-Jeng Lin, DDS; Yueh-Chao Yang, DMD, MS.* Medical College of Virginia (Virginia): C. Daniel Dent, DDS; Julie Sharp, DDS.* University of Louisville (Kentucky): John W. Olson, DDS, MS* Vanderbilt University (Tennessee): Samuel McKenna, DDS, MS.* VAMC Bedford (Massachusetts): William Bornstein, DDS; Mohamad B. Ayas, DDS; Noah I. Zager, DMD.* VAMC Bronx (New York): Ira H. Orenstein, DDS*; Thomas E. Porch, DMD. VAMC Chillicothe (Ohio): John Hofer, DMD*; Craig A. Holman, DDS; Diane E. Land, DDS; Lura Marshall, RDH; Richard Mauger, DDS. VAMC Danville (Illinois): James T. Freestone, DDS; Kevin J. Malley, DDS; John L. Reyher, DDS.* VAMC Dayton (Ohio): James R. Cole, DDS; Paul M. Lambert, DDS.* VAMC Detroit (Michigan): Rami Jandali, DMD, MS; Ahmad A. Kanaan, DDS, MS; Michael L. Linebaugh, DDS, MS; Richard A. Plezia, DDS, MS.* VAMC Houston (Texas): Allan W. Estey, DDS; Harry D. Gilbert, DDS*; George V. Goff, DDS.

VAMC Huntington (West Virginia): Stanley E. Dixon, DMD; Eugene M. Riehle, DDS.* VAMC Kansas City (Missouri): James L. Beatty, DDS; John Bellome, DDS*; Richard J. Crosetti, DDS; Linda Filbern, RDH; Douglas A Pearson, DDS; Rosa B. Solomon, DDS. VAMC Lexington (Kentucky): Dolph R. Dawson, DMD; John Dominici, DDS, MS*; Robert Marciani, DMD. VAMC Little Rock (Arkansas): C. Gary Black, DDS; J. Robert Spray, DDS.* VAMC Loma Linda (California): James E. Yeager, DMD; Warren S. Yow, DMD, MS, MPH.* VAMC Louisville (Kentucky): Paul X. Dattilo, DMD*; Reid Nelson; John W. Olson, DDS; James W. Shaughnessy, DMD. VAMC Memphis (Tennessee): William D. Caldwell, DDS, MS; Daniel L. Reaves, DDS.* VAMC New Orleans (Louisiana): Henry H. Chen, DMD; Arthur G. Howe, DDS*; Daniel D. Gammage, DMD; Laurie Moeller, DDS. VAMC Northport (New York): David A. Abroff, DDS; Anthony J. Casino, DDS*; Richard S. Truhlar, DDS. VAMC Phoenix (Arizona): D. Barnes, DMD*; Vance Cox, DDS. VAMC Pittsburgh (Highland Drive, Penn): Arthur M. Rodriguez, DMD, MS.* VAMC Portland (Oregon): Larry B. Thompson, DDS, MS; J. Ernest Weinberg, DMD, MSD.* VAMC Richmond (Virginia): C. Daniel Dent, DDS; William E. Hunter, DDS*; Lawrence E. Masters, DDS. VAMC Salem (Virginia): Phillip R. Davis, DDS; C. Dudley Parks, DDS*; Michael J. Vasisko, DDS. VAMC San Francisco (California): Richard Navarro, DDS, MS; Rebeka G. Silva, DMD*; Dennis J. Weir, DDS, MA. VAMC Seattle (Washington): John A. Bucher, DMD*; Randall R. Sobczak, DDS. VAMC Sepulveda (California): Mark L. Monson, DDS; Lori A. Walker, DDS.* VAMC Washington, DC: Michael

T. Curran, DDS*; Glenn T. Haggan, DDS.* VAMC West Los Angeles (California): Stephen Ancowitz, DDS; James Callahan, DMD*; Richard Nagy, DDS; Donald Sze, DDS. VAMC West Palm Beach (Florida): Carlos Alvarez, DMD; John Ball, DMD; Alfredo Fernandez, DMD; Jerry Neidlinger, DDS.* VAMC Wichita (Kansas): John David Ball, DDS.*

Laboratories

DVA Central Dental Laboratory (Texas): Eugene Jones, DDS, MS. DVA Central Dental Laboratory (Washington, DC): John McCartney, DDS.

Project Office and Data Management Center

VAMC Ann Arbor (Michigan): Harold F. Morris, DDS, MS†; Shigeru Ochi, PhD†; Jeanne Middlebrook; Leigh Ann Dudley.

REFERENCES

1. Obrez A, Grussing PG. Opinions and feelings on eating with complete dentures: a qualitative inquiry. *Spec Care Dent.* 1999;19:225-229.
2. Pera R, 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;25:462-465.
3. Ambard AJ, Fanchiang JC, Mueninghoff L, Dasanayake AP. Cleansability of and patient satisfaction with implant-retained overdentures: a retrospective comparison of two attachment methods. *J Am Dent Assoc.* 2002;133:1237-1242.

*Principal investigator.

†Project codirector.

4. Allen PF, McMillan AS. A longitudinal study of quality of life outcomes in older adults requesting implant prostheses and complete removable dentures. *Clin Oral Implant Res.* 2003;14:173–179.
5. Bakke M, Holm G, Gorfredsen K. Masticatory function and patient satisfaction with implant-supported mandibular overdentures: a prospective 5-year study. *Int J Prosthodont.* 2002;15:575–581.
6. Awad MA, Lund JP, Dufesne E, Feine JS. Comparing the efficacy of mandibular implant-retained overdentures and conventional dentures among middle-age edentulous patients: satisfaction and functional assessment. *Int J Prosthodont.* 2003;16:117–122.
7. Heydecke G, Boudrias P, Awad MA, et al. Within-subject comparison of maxillary fixed and removable implant prostheses: patient satisfaction and choice of prostheses. *Clin Oral Implant Res.* 2003;14:125–130.
8. Kaptien ML, Hoogstraten J, de Putter C, de Lange GL, Blijdorp PA. Dental implant in the atrophic maxilla: measurements of patients' satisfaction and treatment experience. *Clin Oral Implant Res.* 1998;9:321–326.
9. Nentwig GH. The Ankylos implant system: concept and clinical application. *J Oral Implantol.* 2004;30:171–177.
10. Chou C-T, Morris HF, Ochi S, Walker L, DesRosiers D. AICRG, part II: crestal bone loss associated with the Ankylos implant: loading to 36 months. *J Oral Implantol.* 2004;30:134–143.
11. Morris HF, Ochi S, Winkler S. Introduction: a new and innovative implant design. *J Oral Implantol.* 2004;30:121–124.

NOTE

This is government-supported research and there are no restrictions on its use. The results and opinions presented are those of the authors and do not necessarily reflect the opinions of the Department of Veterans Affairs Medical Research, the Office of Dentistry, or the American Academy of Implant Dentistry. This manuscript does not represent an endorsement of the evaluated implant by the Department of Veterans Affairs or the American Academy of Implant Dentistry.