Patient Evaluation after Treatment with Maxillary Implant-Supported Overdentures

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ABSTRACT

Purpose: To evaluate and compare outcome among patients after implant overdenture treatment in the maxilla.

Materials and Methods: The study sample comprised two groups of patients: group 1, in which the patients were planned for overdenture treatment, and group 2, in which the patients originally were planned for a fixed prosthesis in the maxilla but had overdenture treatment owing to implant failures, resulting in an insufficient number of implants to support a fixed prosthesis. All patients treated with maxillary implant-supported overdentures in the Department of Prosthetic Dentistry, Central Hospital, Skövde, Sweden, between 1993 and 2002 received a questionnaire at their yearly follow-up visit with nine questions related to their treatment. All questions had visual analogue scale response alternatives ranging from a negative to a positive opinion.

Results: Nineteen patients, 10 in group 1 and 9 in group 2, completed the questionnaire, yielding a response rate of 86%. Both groups expressed a high satisfaction rate, and few regretted their choice of treatment. Patients planned for overdenture treatment (group 1) reported significantly fewer speech problems after treatment compared with those originally planned for a fixed prosthesis (group 2, p < .05). No other significant differences between the two groups were seen. *Conclusion:* Within the limitations of the present study, it can be concluded that maxillary implant overdenture treatment may be considered a viable option among patients with an insufficient number of implants for a fixed prosthesis.

KEY WORDS: Fixed prosthesis, implant, overdenture, questionnaire

During the last decades, dental implants have been successfully used in the prosthodontic rehabilitation of the edentulous jaw.¹⁻³ In most patients, there is a sufficient amount of bone of appropriate quality to place four or more implants to support a mandibular complete arch fixed restoration. Lack of bone in the maxilla is, however, more common compared with the mandible and could prevent the placement of the number of implants required for a fixed prosthesis. Numerous studies show high success rates for implant-

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supported overdentures in the mandible, whereas the figures are lower for the maxilla.^{4–7} Moreover, there is evidence that planned overdenture treatments in the maxilla are more successful compared with those in which an overdenture is used as a "rescue treatment" owing to implant failures in patients originally planned for a fixed prosthesis.^{4,7}

Implant treatment in the maxilla is more challenging than in the mandible owing to factors such as aesthetic considerations, phonetics, and oral comfort.⁸ Careful planning of such treatment is therefore of the utmost importance to successfully rehabilitate the patient. In situations in which there is a limited amount of alveolar bone, an implant overdenture could be the treatment of choice if the patient declines bone grafting.

There are numerous reports on implant overdentures that focus on aspects such as changes in marginal bone level adjacent to the implants, soft tissue, and the need for maintenance.^{1–7} However, when evaluating the treatment outcome among patients with maxillary implant overdentures, patient-related factors such as

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oral comfort, aesthetics, and chewing ability are important to include. The patients' opinion and satisfaction will provide the clinician with important information and are useful instruments to develop and further improve techniques using implants in the rehabilitation of the edentulous patient. High satisfaction rates are reported after treatment with implant-supported fixed and removable prostheses in edentulous mandibles.⁹⁻¹¹ Reports regarding such treatment in the maxilla are, however, scarce.^{12,13}

Several attempts have been made to develop instruments to measure patient satisfaction and oral health–related quality of life. The Oral Health Impact Profile instrument has shown good reliability, validity, and precision and comprises a series of questions with five response categories.¹⁰ Another instrument is the visual analogue scale (VAS), in which patients are asked to mark on a line the point that best represents their opinion. The VAS instrument could be used to measure patient satisfaction and has been shown to be a valid and reliable instrument in retrospective studies.^{11,12,14}

The objective of the present study was to evaluate various factors related to patient satisfaction in two groups of patients, both of whom had received treatment with maxillary implant-supported overdentures. The hypothesis of the study was that there are no differences between the two groups with respect to selfassessed oral function, oral comfort, and aesthetics.

MATERIALS AND METHODS

A questionnaire study was included as part of a survey performed among all patients who had been treated with maxillary implant-supported overdentures in the Department of Prosthetic Dentistry, Central Hospital, Skövde, Sweden, between 1993 and 2002. The patients were referred from general practitioners for implant treatment owing to problems with retention of the complete upper denture (CUD). The results from the clinical part of the survey are presented elsewhere.¹⁴ Included in the study sample were individuals planned for overdenture treatment (group 1) and those originally planned for a fixed prosthesis (group 2) but for whom overdenture was the choice of treatment owing to failing implants. Twenty-seven individuals were identified from patient charts; 14 were men and 13 were women, with a mean age of 63.3 years (range 46-76 years). Five patients originally treated with an implant-supported overdenture in the maxilla were excluded from the study sample because they had lost all implants and had a conventional denture made. The remaining 22 patients all wore the original implant-supported maxillary overdenture.

All subjects had received Brånemark System[®] Mk II implants (Nobel Biocare AB, Göteborg, Sweden) supporting a rigid cast gold alloy bar (Protor 3, Type 4, Cendres' Metaux, Biel-Bienne, Switzerland). The bar was designed with two ball attachments (OT Cap, Rein 83, Bologna, Italy) placed close to the implants in the position of the lateral or canine teeth to support the overdenture. Denture retention was provided by replaceable nylon caps positioned in the denture base acrylic. No bars were designed with distal extensions, thus making the denture supported by implants and oral mucosa. Different overdenture designs were chosen depending on factors related to the patient, that is, gag reflexes, oral comfort, and personal preference (Table 1).

The patients received a questionnaire with nine questions at the yearly recall examination in 2002 and were asked to return the completed questionnaire in a self-addressed, stamped envelope. The questions addressed factors related to treatment outcome, such as patient satisfaction and oral function, and were the same or similar to those used in other studies on patients' satisfaction (Table 2).^{15,16} All questions had a VAS ranging from a negative to a positive attitude. The VAS was later coded by one of the authors in 10 equidistant steps, where a high numeric value represented a positive opinion.

Data were analyzed using descriptive statistics. Levene's independent samples test was used for testing

TABLE 1 Distribution and Prosthodontic Design of Maxillary Implant-Supported Overdentures				
	No. of Overdentures			
Design	Group 1* (<i>n</i> = 10)	Group 2 [†] (<i>n</i> = 9)		
Cobalt chromium framework (palatal strap)	4	6		
Cobalt chromium framework ("horseshoe")	—	1		
Acrylic resin (full palatal coverage)	6	2		

*Originally planned for overdenture.

[†]Originally planned for fixed prosthesis.

TABLE 2 Percentage Distribution of Mean Values of Responses to Visual Analogue Scales						
Variable	Group 1 [†] (<i>n</i> = 10)	SD	Group 2 [‡] (<i>n</i> = 9)	SD	р	
1. "Does the denture feel firmly fixed in your mouth?"	7.1	3.3	8.2	2.0	.390	
2. "Can you chew all kinds of food without any difficulties?"	8.2	3.0	8.3	1.8	.946	
3. "Do you find it easy to clean around the implants?"	8.7	2.2	6.0	3.8	.082	
4. "Has speech been affected after you received your denture?"	9.7	.8	8.1	2.1	.046*	
5. "Are you satisfied with the aesthetic appearance of your denture?"	8.1	2.4	8.2	1.5	.923	
6. "Was it difficult to adapt to your denture after receiving it?"	8.6	2.9	8.0	2.0	.628	
7. "In all, are you satisfied with the function of your denture after it was delivered?"	8.1	2.9	8.3	1.8	.865	
8. "Has the outcome of the treatment fulfilled your expectations?"	8.0	3.1	7.9	2.1	.935	
9. "Would you choose the same treatment today if you had the option?"	7.8	3.1	8.1	2.3	.802	

*Significant, $p \leq .05$.

[†]Originally planned for overdenture.

[‡]Originally planned for a fixed prosthesis.

equality of variances in performing the *t*-test to obtain significance. The level of significance was set at p < .05. All data analyses were performed using *SPSS*, version 6.1 (SPSS Inc, Chicago, IL), for the Macintosh.

RESULTS

Of the original sample, three patients declined to participate owing to medical reasons.

Nineteen patients, 10 from group 1 and 9 from group 2, completed the questionnaire and returned it to the investigators, rendering a response rate of 86%. There was an equal distribution of men and women among the patients, and the mean age was 61.8 years in group 1 (range 54–71 years) and 61.7 years in group 2 (range 46–72 years). The mean follow-up period for patients in group 1 was 6.1 years (range 4.1–7.3 years) and 7.6 years (range 5.0–9.3 years) for patients in group 2. The mean number of implants among patients in group 1 was 3.3 (range 2–4 implants), whereas the corresponding number for those in group 2 was 3.7 implants (range 2–6). There were no statistically significant differences between the responders and non-responders with respect to age and gender.

Both groups expressed a high satisfaction rate, and few regretted their choice of treatment (see Table 2). A few individuals in both groups expressed lower rates for function and overall satisfaction. Patients in group 1 reported significantly fewer speech problems after treatment compared with those in group 2 (p < .05). No other significant differences between the two groups were seen.

DISCUSSION

Long-term follow-up studies to monitor changes in function, oral comfort, and aesthetics over time are important when evaluating patient satisfaction after prosthodontic treatment. This is true especially for removable dentures, which usually require a higher need for maintenance and adjustments compared with fixed prostheses.¹⁷

In the present study, a striking similarity in most responses between the two treatment groups was seen. The fact that patients in group 2 originally were planned for a fixed prosthesis and had experienced failing implants did not seem to have resulted in a negative opinion toward a removable denture. They had, in fact, been offered reoperation to replace the lost implant(s) to provide treatment with a fixed prosthesis, but all declined and instead chose an overdenture supported by the remaining implants. Reoperation always includes an additional healing period, in which the patient has to use a denture provided with provisional soft relining material. The extended healing period and a potential risk of additional complications related to the surgery may have prevented the patients from choosing reoperation.

An overall high rating of patient satisfaction was reported in both groups (see Table 2). The results resemble those reported in other studies on patient satisfaction after implant overdenture treatment in the maxilla.^{12,13} In a comparative study on maxillary implant-supported overdentures using different designs, that is, with and without palatal coverage, high patient satisfaction for both treatments was reported and no differences were seen with respect to denture stability, retention, speech, and general satisfaction.¹²

A few patients in both groups expressed lower VAS ratings of satisfaction. They all had experienced major problems with denture retention and frequently needed to replace the retentive nylon caps. A problem with denture retention was the most common reason for wanting implant treatment, and for some, the expectations may have been exaggerated. Patients in group 1 reported fewer problems with cleaning around the implants compared with those in group 2, but no statistically significant differences were seen (see Table 2). A shortcoming in the analysis is the small sample size, which makes it difficult to compare and evaluate differences between the two groups.

Although all patients in the present study had been wearing a CUD for several years prior to implant treatment, phonetic problems were more common among those in group 2 (see Table 1). A possible explanation could be that the majority of the patients in group 2 received an overdenture with a chrome cobalt framework designed with a palatal strap, whereas the majority in group 1 received an overdenture with an acrylic resin full palatal coverage, which resembled the design of the patients' previous CUD (see Table 1). The findings in the present study are in contrast to those found in a previous trial on maxillary implant overdentures.¹² Although the overdentures in that study were designed with and without palatal coverage, patients in both groups gave high ratings for speaking ability and no significant differences between the groups were found. However, all patients were provided with long-bar implant-supported dentures, making the overdenture entirely supported by implants rather than by the mucosa and implants together, which was true for the overdentures in the present study.

The fact that patients in group 2 primarily wanted a fixed prosthesis could also indicate that they had experienced speech problems related to their conventional denture. On all patients, a custom-made cast gold alloy bar was used to splint the implants, which requires more space in the denture base compared with prefabricated bar systems. In some treatments, this resulted in a somewhat bulky denture design in the upper anterior area. It is possible that this design may have been more difficult for patients in group 2 to tolerate, resulting in more speech problems. The findings in the present study indicate that problems with speech after prosthodontic treatment in the maxilla may occur more frequently than could be expected. Especially among older individuals with reduced hearing ability and impaired oral motor functions, special attention should be given to the design of the new prosthesis, making it as identical as possible to the previous one.

Poor stability and retention are more often associated with the lower than the upper denture. One of the first studies on implant-supported removable prosthodontics was published almost 20 years ago.¹⁸ Since then, numerous reports in the literature show a high success rate with mandibular implant overdenture treatment, and today, two implants are generally considered sufficient for supporting such a denture.^{19,20} However, there are no specific guidelines regarding the number of implants necessary for the support of a maxillary overdenture. In the present study, 16 patients (84%) had 4 or fewer implants to support the overdenture. Factors such as implant position, length, and bone quality are important to evaluate when planning for treatment with fixed or removable prosthodontics.

In general, implants may be considered for the support of an upper fixed prosthesis among edentulous patients suffering from dry mouth and among those who cannot accept a removable denture because of severe gag reflexes or for psychological reasons. However, in a study on maxillary implant-supported overdentures, it was concluded that there is no indication to recommend maxillary implants to patients who are satisfied with their conventional dentures.¹² It is important that the clinician always tries to identify the patient's need for treatment, and edentulous individuals with dentures that function well considering a maxillary implant-supported prosthesis should always be informed about the cost-benefit aspects and be advised to carefully reflect on factors related to implant failure rates for the maxilla and the need for maintenance.

All patients had completed their treatments more than 4 years prior to the time of the study. Although each patient had been carefully examined and appropriate denture adjustments, including relinings, had been performed at the yearly recall examinations, it is possible that denture stability and retention were not as good as when the denture was delivered. However, despite the need for maintenance and adjustments, the majority of the patients gave high ratings for most of the items and few regretted their choice of treatment (see Table 2).

The VAS is a reliable instrument when evaluating patient assessment after prosthodontic treatment.^{12,15,17} The questions used in the present study had shown good discrimination in a previous study on patient evaluation after prosthodontic treatment.¹⁵ The results from the present study should, however, be interpreted with some caution owing to the limited sample size.

CONCLUSION

The results from the present study showed high satisfaction rates among patients provided with implant overdentures in the maxilla. Patients originally planned for a fixed prosthesis experienced more speech problems compared with those planned for overdenture treatment, but no other significant differences between the two groups were registered. To minimize the risk of speech problems, special attention should be given to the design of the new denture, making it as identical as possible to the previous one. A maxillary implant overdenture may be considered as a treatment option among patients with an insufficient number of implants for a fixed prosthesis. A shortcoming in the analysis is, however, the small sample size, which makes it difficult to compare and evaluate differences between the two groups.

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