

Analysis of Satisfaction Levels in Completely Edentulous Patients Treated with Different Configurations of Implant-Supported Protheses

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Purpose: To evaluate and compare patient satisfaction levels in edentulous patients treated with different configurations of implant-supported protheses as well as previous prosthesis experiences before implant treatment. **Materials and Methods:** A study population of 142 patients was identified and separated into four treatment groups: group 1 comprised 43 patients treated with an implant-supported overdenture in the mandible and conventional complete denture in the maxilla; group 2 comprised 32 patients treated with implant-supported overdentures in the maxilla and mandible; group 3 comprised 26 patients treated with an implant-supported overdenture in the mandible and a fixed prosthesis in the maxilla; and group 4 comprised 41 patients treated with implant-supported maxillomandibular fixed restorations. Questionnaires asking about masticatory performance, pronunciation, comfort, and social ability were used to evaluate treatment outcomes. **Results:** The patients in group 4 were significantly more satisfied regarding masticatory performance than other treatment modalities. Visual analog scale (VAS) scores for comfort and social ability were similar in groups 3 and 4 and significantly higher than those in groups 1 and 2. The patients who used a conventional removable prosthesis before implant treatment were more satisfied with their implant-supported prosthesis regarding social ability ($P = .03$). **Conclusions:** The treatment design of an implant-supported fixed prosthesis in the maxilla and implant overdenture in the mandible provided a comparable level of satisfaction with maxillomandibular fixed prosthesis for edentulous patients. This combination served as a practical solution especially for patients with mandibular atrophy who would require extensive surgeries to support maxillomandibular fixed protheses. In the maxilla, patient satisfaction with an implant-supported overdenture was not superior to that with a conventional prosthesis. Note that previous removable prosthesis experience may influence social comfort for patients. *Int J Oral Maxillofac Implants 2024;39:776–782. doi: 10.11607/jomi.10734*

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Several designs of implant-supported protheses can be used to restore edentulous patients.¹ Implant-supported protheses offer significant improvements in facial esthetics, self-image, the social well-being of patients, as well as oral function.^{2–4}

The impact of oral health and prosthesis experience on patients' social life and self-confidence makes patient-based evaluations increasingly important.^{5,6} Patient-based studies are needed to better understand patient demands, perceptions, attitudes, and expectations. As such, the Oral Health Impact Profile (OHIP) has

served as a powerful tool in the assessment of patient quality of life. Simplified OHIP-14 and OHIP-EDENT questionnaires have been developed to provide information about functional capability, oral pain, psychologic comfort, and social well-being.^{5–8} Implant-supported fixed and removable protheses for patients with edentulous maxillae were evaluated with questionnaires in a prospective study,¹ and implant-supported overdentures and fixed protheses were retrospectively compared and assessed by edentulous patients using OHIP-14.⁸

The current retrospective investigation aimed to compare satisfaction levels of edentulous patients rehabilitated with implant-supported removable protheses, maxillomandibular implant-supported fixed protheses, a combination of an implant-supported fixed prosthesis in the maxilla and an implant overdenture in the mandible using a questionnaire. The authors hypothesized that the patients who experienced a conventional removable prosthesis before implant treatment would report higher satisfaction levels with implant-supported protheses compared to patients who had not experienced a conventional removable prosthesis.

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MATERIALS AND METHODS

The records of patients treated with implant-supported prostheses were reviewed. Edentulous patients treated with an implant-supported fixed or removable prosthesis at the University of Selçuk from February 2013 to May 2020 were invited to the clinic to participate in this study, which follows the declaration of Helsinki. The ethical committee of the University of Selçuk approved the study (04.10.2012 and no.2012/10). All patients signed a written consent form before participating.

Population Study Group

Completely edentulous patients treated with implant-supported overdentures and/or fixed prostheses at least 1 year prior to this study were invited to the clinic and asked to take part in the study. The following patient populations were excluded from this study: patients treated with the All-on-4 concept or zygoma implants, patients who had only one edentulous arch or a partially edentulous arch, patients with soft or hard tissue inflammation in the oral cavity, and patients with cognitive impairment.

Overall, 142 patients who met the inclusion criteria and fulfilled the questionnaires were included and grouped according to their treatment protocols. Group 1 comprised 43 patients treated with an implant-supported overdenture in the mandible and a conventional complete denture in the maxilla. Group 2 comprised 32 patients treated with implant-supported overdentures in both the maxilla and mandible. Group 3 comprised 26 patients treated with an implant-supported overdenture in the mandible and an implant-supported fixed prosthesis in the maxilla. Lastly, group 4 comprised 41 patients treated with implant-supported maxillomandibular fixed restorations (Table 1).

Measurements

Questionnaire

Patient satisfaction levels were evaluated using a questionnaire modified and translated from the Oral Health Impact Profile in Edentulous Adults (OHIP-EDENT) questionnaire (Fig 1). This questionnaire also included a checklist for patients to mark any previous experience with fixed or removable prostheses. Each participant filled out the questionnaire, and study groups were then separated into three groups according to previous prosthesis type: (1) complete denture users, (2) partial removable prosthesis users, and (3) fixed prosthesis users.

The patients expressed satisfaction on a visual analog scale (VAS) concerning their prosthesis by following instructions such as "Please put a mark on the linear scale below in accordance with masticatory capacity of the prosthesis." The questionnaire covered masticatory

Table 1 Description of Treatment Groups

Patient group	Treatment type in maxilla	Treatment type in mandible
Group 1 (n = 43)	Conventional complete denture	Implant-supported overdenture
Group 2 (n = 32)	Implant-supported overdenture	Implant-supported overdenture
Group 3 (n = 26)	Implant-supported fixed prosthesis	Implant-supported overdenture
Group 4 (n = 41)	Implant-supported fixed prosthesis	Implant-supported fixed prosthesis

performance, pronunciation, oral pain and comfort, as well as social ability.

Statistical Analysis

The data were statistically analyzed with the Statistical Package for the Social Sciences (SPSS) 15.0 program. The Kruskal-Wallis test was used to compare satisfaction levels of groups, and chi-square tests were used for grouped variables.

RESULTS

A total of 142 patients (51 males and 91 females; mean age 60.34 ± 8.29 years) were included. The average follow-up periods were 28.7 ± 17.7 months (range 12 to 84 months).

The patients treated with implant-supported removable prostheses (groups 1 and 2) were significantly less satisfied with masticatory function, comfort, and social ability ($P = .002$, $P = .000$, $P = .000$, respectively). There was no significant difference between group 1 and group 2 regarding whole parameters. There was no significant difference among the four groups in terms of speaking ability ($P > .05$; Table 2).

The patients in group 4 were significantly more satisfied than group 3 regarding masticatory function. However, there was no significant difference between group 3 and group 4 regarding social ability and oral comfort (see Table 2).

When considering past use of a removable prosthesis, the experience factor had no significant effect on VAS scores for mastication, speech, and oral comfort. However, previous removable prosthesis experience resulted in significantly higher scores regarding social ability ($P = .03$). Study groups were also subgrouped according to previous prosthesis type. The patients in group 4 who were past complete denture users had significantly higher VAS scores regarding mastication and comfort than the patients who were past partial removable prosthesis users and past fixed prosthesis users (Table 3).

Questionnaire

Please put a mark on the linear scale below in accordance with the **masticatory capacity** of the prosthesis.

Not satisfied _____ Totally satisfied

Please put a mark on the linear scale below in accordance with your **speaking ability** with your prosthesis.

Not satisfied _____ Totally satisfied

Please put a mark on the linear scale below in accordance with **oral pain and comfort** in your mouth with the prosthesis.

Not satisfied _____ Totally satisfied

Please put a mark on the linear scale in accordance with your **social ability** with the prosthesis.

Not satisfied _____ Totally satisfied

Prosthesis type before implant treatment			
Maxilla	<input type="checkbox"/> Removable complete denture	<input type="checkbox"/> Partial removable prosthesis	<input type="checkbox"/> Fixed prosthesis
Mandible	<input type="checkbox"/> Removable complete denture	<input type="checkbox"/> Partial removable prosthesis	<input type="checkbox"/> Fixed prosthesis

Fig 1 Patient satisfaction questionnaire and checklist for previous type of prosthesis.

Table 2 VAS Scores for All Treatment Groups in Terms of Masticatory Performance, Pronunciation, Comfort, and Social Ability						
Feature (VAS score)		Group 1	Group 2	Group 3	Group 4	P
Mastication	Median	79 ^a	79.5 ^a	84 ^b	96 ^c	.000
	Min	30	50	51	38	—
	Max	100	100	100	100	—
Pronunciation (speaking ability)	Median	90	90	90.5	92	.810
	Min	5	57	71	48	—
	Max	100	100	100	100	—
Comfort	Median	80 ^a	80 ^a	90 ^b	94 ^b	.000
	Min	29	53	56	80	—
	Max	97	100	100	100	—
Social ability	Median	86 ^b	82 ^a	98 ^b	100 ^b	.000
	Min	30	50	65	43	—
	Max	100	96	100	100	—

VAS = visual analog scale; group 1 = implant-supported overdenture in mandible and conventional complete denture in maxilla; group 2 = implant-supported overdentures in maxilla and mandible; group 3 = implant-supported overdenture in mandible and fixed prosthesis in maxilla; group 4 = implant-supported maxillomandibular fixed restorations. ^{a,b,c} The difference was significant between different letters.

DISCUSSION

While implant-supported fixed prostheses and removable prostheses have been compared in many studies, different combinations of prostheses for the mandible and maxilla have not been evaluated before in terms of patient satisfaction. In the present study, we evaluated the satisfaction levels of edentulous patients treated with different configurations of implant-supported prostheses. To help patients understand what their prosthesis will do for them, clinicians can use the planning phase to guide patient expectations. While most patients prefer a fixed restoration, the prosthetic options available can be determined by financial limitations as well as physiologic factors such as the level of remaining bone. Insufficient bone volume may require extensive surgeries for a fixed prosthesis design, or implant overdentures may be preferred by both patient and practitioner. The All-on-4 technique is an alternative for patients with insufficient bone volume, but it was not evaluated in this study.

In the present study, patients in group 3 were treated with an implant-supported fixed prosthesis in the maxilla and an implant overdenture in the mandible, thereby avoiding extensive augmentation surgeries in the mandible. We also evaluated satisfaction levels of the patients treated with other configurations of implant-supported prostheses, as patient satisfaction levels for these prosthesis combinations have not been analyzed sufficiently in the literature.

Questionnaires are a useful tool to evaluate patient-based outcomes. Canallatos et al⁹ used a questionnaire called the Quality of Life with Implant Prosthesis (QoLIP) to evaluate satisfaction levels of patients treated with implant-supported prostheses. QoLIP included items asking about chewing, pronunciation, social ability, dentofacial esthetics, as well as oral pain and hygiene.⁹ Gurgel et al¹⁰ evaluated the degree of satisfaction patients had when treated with implant-supported prostheses by asking questions about chewing, comfort, and speaking ability following at least 6 months of use of the new prosthesis. Similarly, De Souza et al¹¹ evaluated treatment satisfaction levels of edentulous patients with a questionnaire following a 6-month wearing period with a new prosthesis. In the present study, a modified version of OHIP-EDENT was used following a minimum of 12 months of wearing the new prosthesis/prostheses.

Yao et al¹² reviewed the published papers that compared the satisfaction levels of patients who were treated with implant-supported fixed or removable prostheses. Although there were conflicting results among reported outcomes, implant-supported fixed prostheses performed better in overall satisfaction.¹² The present study supported the finding that variations

Table 3 Analysis of Statistical Significance Among Subgroups of Prosthesis Type Before Implant-Supported Prosthesis

Previous prosthesis	Mastication (P value)	Pronunciation (speaking ability) (P value)	Comfort (P value)	Social ability (P value)
Group 1				
n ₀ : 25 n ₁ : 15 n ₂ : 3	.289	.691	.367	.655
Group 2				
n ₀ : 13 n ₁ : 12 n ₂ : 7	.609	.502	.187	.413
Group 3				
n ₀ : 9 n ₁ : 14 n ₂ : 3	.540	.085	.566	.194
Group 4				
n ₀ : 11 n ₁ : 10 n ₂ : 9	.003	.851	.03	.778

n₀ = complete denture users before implant treatment; n₁ = partial removable denture users before implant treatment; n₂ = fixed prosthesis users before implant treatment.

in satisfaction levels of patients could have been related to the treatment. In general, chewing ability and comfort are also primary factors affecting patient satisfaction in both the maxilla and mandible. However, esthetics and speech are more important in the maxilla than in the mandible.^{13–15}

The present study compared four of the most prevalent implant treatment scenarios for completely edentulous patients. According to our study, the rehabilitation type in the maxilla is a more prominent factor affecting comfort and social ability than the rehabilitation type in the mandible. While speaking ability was rated similarly by all four groups, scores of masticatory function, comfort, and social ability were significantly lower in groups of patients with removable prostheses (groups 1 and 2). In addition, similar satisfaction levels were obtained for patients in groups 1 and 2 regarding masticatory function. This result demonstrates that the mandible is critical for masticatory function in patients with maxillomandibular removable prosthesis. Conventional complete dentures (group 1) and implant-supported overdentures in the maxilla (group 2) may provide similar functional results. Contrary to expectations, implant-supported removable prostheses in the maxilla did not improve the quality of life compared to complete dentures.

Similar satisfaction levels were also obtained for patients in groups 3 and 4 regarding oral comfort and

social ability. Moreover, replacing a removable prosthesis with a fixed prosthesis in the maxilla provides good stability due to the fixed nature of the prosthesis. In our study population, the higher satisfaction levels of oral comfort and social ability may be explained by the fixed prosthesis in the maxilla. Furthermore, removing the acrylic flange when moving to a fixed prosthesis design in the maxilla has a positive effect on oral comfort.

In the mandible, a removable prosthesis instead of severe and expensive surgeries provided sufficient satisfaction levels in patients who had unfavorable conditions in their mandibles. However, a study comparing implant-supported hybrid fixed restorations and implant overdentures found that implant-supported fixed hybrid restorations scored higher than implant overdentures in terms of oral comfort in patient questionnaires.¹⁶ In the present study, groups 3 and 4 had similar scores regarding oral comfort. In a retrospective study of 62 patients, Brennan et al⁸ compared the satisfaction levels of edentulous patients treated with an implant-supported fixed prosthesis versus a removable prosthesis and reported that implant-supported fixed prostheses resulted in significantly better patient satisfaction levels in terms of masticatory function and psychologic disability.⁸ De Souza et al¹¹ compared satisfaction levels of 75 patients treated with fixed or removable prostheses. Both treatments presented satisfaction above 87%, with no statistical difference in terms of chewing, phonetics, social comfort, esthetics, and pain.¹¹

In several studies, the prosthetic structure of the opposing arch was not described. Study groups were also biased in a majority of studies that compared satisfaction levels because patients in groups had one edentulous arch but the opposing arch was not standardized.^{8,11,17} To obtain standardized data, the present study grouped patients according to treatment combinations in the maxilla and mandible. De Souza et al¹¹ also reported that high patient demands, unrealistic patient expectations, and lack of information provided by the clinician before treatment were possible reasons for patient dissatisfaction. Heydecke et al¹⁸ compared implant-supported fixed prostheses with implant-supported overdentures in the maxilla when opposed by an implant overdenture in the mandible in a subject crossover trial. They concluded that implant-supported overdentures in the maxilla resulted in higher satisfaction regarding ability to speak, social ability, and ease of cleaning. However, masticatory performances were similar in both groups.¹⁸ In our study, the implant overdenture group (group 2) was less satisfied than the implant-supported fixed prosthesis group in the maxilla and implant overdenture in the mandible (group 3) regarding masticatory performance, social ability, and comfort; these results are contrary to the findings

reported by Heydecke et al.¹⁸ In Heydecke et al's study,¹⁸ speaking ability was also reported to be better with an implant overdenture in the maxilla compared to a fixed prosthesis. In the present study, there was no significant difference between maxillary implant-supported fixed prostheses versus implant-supported overdentures in terms of speaking ability when opposed by an implant overdenture in the mandible.

Implant-supported overdentures permit better chewing than conventional prostheses with a reduced-duration chewing cycle.^{19–22} Feine et al¹⁹ compared the efficiency of the masticatory function of fixed and removable implant-supported prostheses using electromyographic recordings in edentulous patients; they reported that there was no significant difference between the two treatment modalities. A force meter was another tool used to compare the occlusal force of implant-supported overdentures and conventional complete dentures.²² In the present study, patients' masticatory performances were evaluated subjectively, and patients with removable prostheses reported significantly less satisfaction. The combination of an implant-supported fixed prosthesis in the maxilla and an implant-supported overdenture in the mandible (group 3) did not result in as high of satisfaction levels as implant-supported maxillomandibular fixed prostheses (group 4) regarding masticatory function. Nevertheless, patients in groups 3 and 4 both reported greater satisfaction than groups 1 and 2 regarding chewing. Quirynen et al²³ reported better satisfaction levels in patients treated with implant-supported fixed prostheses compared with implant-supported overdentures.

Phonetic problems are often reported in patients treated with implant-supported fixed prostheses due to the gap between the mucosa and fixed prosthesis.¹⁵ Improper localization of maxillary incisors may affect speech, especially in cases where an edentulous maxilla is treated with an implant-supported fixed prosthesis. In a study by Johar,²⁴ difficulties in speaking with an implant-supported prosthesis were evaluated, and implant-supported overdentures were reported to result in better phonetics than conventional dentures. The present study investigated the comfort ratings of patients while speaking and noted that there was no significant difference between treatment modalities. Similar VAS scores in treatment groups regarding pronunciation could be explained by the fact that patients had already worn their prostheses for at least 1 year before taking part in our questionnaire. The patients most likely got used to speaking with their new prosthesis and forgot about the difficulties associated with new prostheses.

Many researchers investigate additional factors that may affect patient satisfaction levels regarding their implant prosthesis, such as age, sex, educational

status, marital status, way of life, number of implants, and complications.^{6,9,10,25–27} In the present study, the previous removable prosthesis experience was evaluated as a potential factor affecting patient satisfaction level. Patients who wore a conventional removable prosthesis before implant treatment reported in higher VAS scores for social ability. We also created subgroups based on previous prosthesis type (ie, complete dentures, partial removable prostheses, and fixed dentures. Because there were not enough patients in the subgroups, groups 1 to 3 could not be statistically evaluated. However, in group 4, patients who wore a complete denture prior to treatment with an implant-retained fixed prosthesis reported higher scores regarding masticatory function and oral comfort. The transition from conventional complete dentures to implant-supported fixed prostheses significantly influences patient perception positively regarding masticatory function and oral comfort. Bonnet et al²⁸ investigated the effect that a renewal of a removable denture had on patient satisfaction by evaluating satisfaction before and after. This led the author to conclude that the previous removable denture experience moderately affected satisfaction.²⁸ However, to obtain more reliable results about patient perceptions, questionnaires should be carried out with a larger population.

CONCLUSIONS

In this study, four main treatment scenarios were compared for patient satisfaction level. The patients with maxillomandibular implant-retained fixed prostheses were more satisfied with masticatory function, social ability, and comfort than patients with implant-supported overdentures. However, a third alternative was the combination of an implant-supported fixed prosthesis in the maxilla and an implant-supported overdenture in the mandible, which satisfies patients because it avoids extensive surgeries while still providing excellent function and comfort.

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ED, Öİ, and D.D. conceived the study aims and design; ED, GÖ, and Öİ collected the data; ED and GÖ analyzed the data; ED and DD led the writing. The authors declare that they have no financial or personal relationships with people or organizations that could inappropriately influence their work. This research received no specific grant from any funding agency.

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