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## Satisfaction of patients fitted with implant-retained overdentures

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### Abstract

**Objective:** to evaluate patient satisfaction with implant-retained overdentures, and its relationship with age, sex, period of follow-up, the rehabilitated jaw (maxilla, mandible or both), number of implants, splinting, type of attachment and the antagonist. **Material and methods:** the study comprised patients with overdentures fitted between January 1996 and June 2007, and with a minimum follow-up of one year. Data regarding patients and prostheses were collected. The patients indicated their overall satisfaction on a visual analogue scale (VAS) from 0 to 10, as well as satisfaction for individual items such as aesthetics, speech, mastication, prosthetic stability and self-esteem. These data were collected one month after fitting the prostheses, at 12 months and at a final examination. **Statistical analyses** were made using the SPSS version 15, statistical significance was considered for  $p < 0.05$ . **Results:** the study included 95 patients, 43 men and 52 women, with a mean age of 55.9 years; 76 edentulous mandibles and 31 edentulous maxillae were rehabilitated with 107 overdentures. One hundred and thirty-seven implants were placed in the maxilla, and 224 in the mandible. The mean level of overall satisfaction was 9 at one month of fitting the prosthesis, 8.8 at 12 months and 8.7 at the final control (mean 71 months). **Conclusions:** the patients fitted with implant-retained overdentures expressed a high level of overall satisfaction, independently of age, sex, length of follow-up, rehabilitated jaw, number of implants per overdenture, whether splinted or non-splinted, and type of attachment. Men were more satisfied with mastication and stability.

**Key words:** Level of satisfaction, overdentures, dental implants.

### Introduction

The implant-retained overdenture is an effective treatment for the rehabilitation of edentulous patients, able to restore both function and aesthetics. The McGill University (Canada) consensus statement on overdentures, issued in 2002, recommends mandibular 2-implant

overdentures as first choice standard of care for edentulous patients (1).

In recent years, high levels of satisfaction have been reported in patients wearing implant-retained overdentures (2-5). MacEntee et al. (3) studied patient satisfaction with 2-implant mandibular overdentures using a visual analogue scale (VAS) from 0 to 100; overall

satisfaction in the bar-clip attachment group was 93 one month after fitting and 96 after two years, and in the ball-spring group 94 and 93 respectively. In a recent study, Krennmair et al. (5) evaluated overall satisfaction with 4-implant mandibular overdentures on retained with a milled bar obtaining a satisfaction of 4.8 out of 5 after a mean of 59.2 months. Various studies report that patients wearing implant-retained overdentures (IRO) were more satisfied than those with conventional complete dentures (CCD) both at one year (6), two years (7) or at seven years (8). However, Assunção et al. (9) found similar levels of satisfaction for the IRO and the CCD. In a recently published meta-analysis (10) a higher satisfaction was observed with IRO than CCD.

The aim was to study overall satisfaction and satisfaction with aesthetics, speech, mastication, stability, and self-esteem in patients with implant retained overdentures (IRO), and likewise, the relationship with age, sex, length of follow-up, rehabilitated jaw, number of implants, splinting, type of attachment and antagonist.

## Materials and Methods

### *-Patient selection*

The study comprised all completely edentulous patients, in one or both jaws, rehabilitated with implant-retained overdentures from January 1996 to June 2007. Exclusion criteria were patients with prostheses placed with less than 12 months follow-up or incomplete data.

### *-Surgical technique and prosthetic rehabilitation*

All surgeries were carried out under local anesthetic with articaine at 4% and with adrenaline 1:100,000 (Artinibsa®, Laboratorios Inibsa S.A, Lliçá de Vall, Barcelona, Spain) by professors at the Department of oral surgery and implantology. Full thickness flaps were raised, placing 4 to 6 implants in the maxilla and 2 to 4 implants in the mandible.

Three months after surgery the overdentures were fabricated by the same prosthodontist and the same laboratory technician. Overdentures on non-splinted implants were connected using either single ball attachments or the Locator® attachment system (Zest Anchors, Escondido, California, USA), and for prostheses on bar-splinted implants, ball attachments (OT CAP®, Rhein '83, Bolonia, Italy) or Preci-vertex® Riders (Alphadent, Waregem, Belgium) were used.

### *-Data collection and evaluation of satisfaction*

Data regarding patients (age, sex, length of follow-up, rehabilitated jaw) and characteristics of the prostheses (number of implants, splinting, type of attachment and antagonist) were collected. Patients indicated satisfaction with the IRO on a 10 cm, 10-point VAS (11). Those patients with previous conventional prostheses also indicated their overall satisfaction with said prosthesis.

Overall satisfaction, as well as satisfaction with aesthetics, speech, mastication, stability and self-esteem was

evaluated at one month of placing the prosthesis, at 12 months and at a final examination; each patient marked a vertical line at the point on the horizontal line that represented their response.

The relationship between age, sex, length of follow-up, rehabilitated jaw, number of implants, splinting, type of attachment and antagonist were analyzed for the different satisfaction indicators studied.

### *-Statistical analysis*

The statistical analysis was made using the SPSS version 15. All measures were tested for statistical significance and were declared significant for  $p < 0.05$ .

The Spearman correlation coefficient was calculated to evaluate the relationship between satisfaction (nonparametric variable) and quantitative variables with a wide range of values (age). Two tests were used to study the relationship between satisfaction and variables with few values, the Mann-Whitney test for variables with two categories (maxilla or mandible), and the Kruskal Wallis test for more than two categories (number of mandibular implants).

## Results

One hundred and fifteen patients were rehabilitated with implant-retained overdentures; of these, 16 patients were excluded for lack of follow-up, and 4 for not completing the questionnaires. In total 95 patients were included in the study, 43 men and 52 women, with a mean age of 55.9 years (range 23-80 years) and a follow-up period of 71 months (range 12-135 months). Three hundred and sixty-one implants were placed, 137 in the maxilla and 224 in the mandible. The maxilla was rehabilitated in 19 patients, the mandible in 64 patients and both in 12 patients, fitting a total of 107 overdentures, 31 in the maxilla and 76 in the mandible (Fig. 1). The mean number of implants per overdenture was 3.3 (4.4 in the maxilla and 2.9 in the mandible). The type of each IRO antagonist is shown in figure 2. The 65 patients with conventional complete removable prostheses received a total of 71 IRO. These patients were significantly more satisfied with the IRO at one month and one year (9 and 8.9) than with the previous conventional complete prosthesis (3.3) ( $Z = -7.36$ ,  $p < 0.05$ ).

Initially the level of overall satisfaction, and satisfaction for all the variables (aesthetics, speech, mastication, stability and self-esteem) was high, and was maintained at one year and at the final examination (Table 1).

Correlation between age and overall satisfaction showed no significant differences ( $p > 0.05$ ). Nor were significant differences found when relating age with the various indicators of satisfaction, with the exception of stability ( $p = -0.23$ ,  $p < 0.05$ ). At the final examination, older patients were less satisfied with the stability of the overdentures.

Men were significantly more satisfied than women with

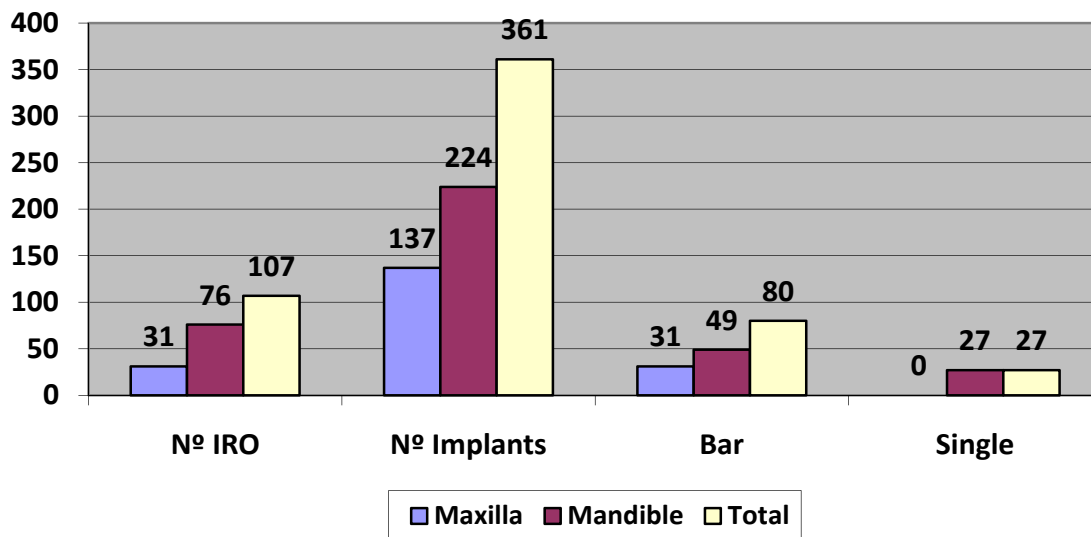


Fig. 1. Implants and prostheses: Bar = N° IRO with bar. Single = N° IRO on single implants.

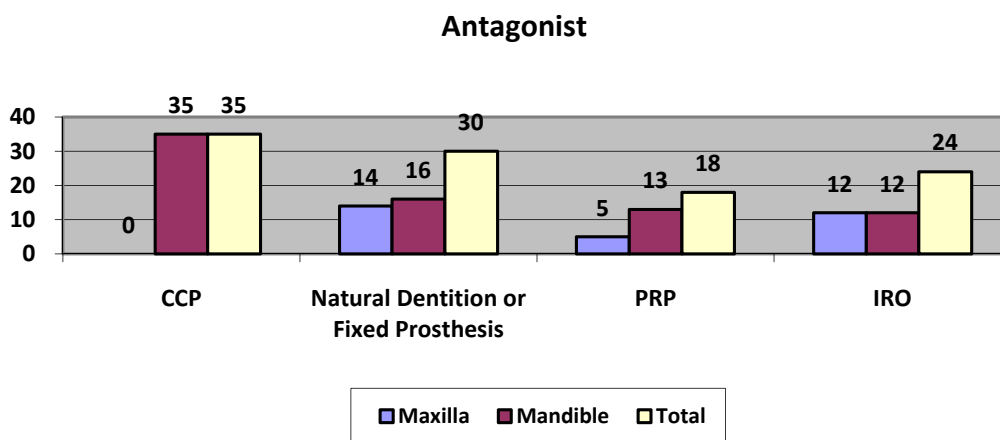


Fig. 2. Type of antagonist: CCP= complete conventional prosthesis, PRP= partial removable prosthesis, IRO= implant-retained overdenture.

Table 1. Patient satisfaction with overdentures at one month, one year, and at the final examination (mean 71 months).

Satisfaction IRO	1 month	SD	12 months	SD	FE	SD
Overall	9.0	1.1	8.9	1.2	8.7	1.1
Aesthetics	9.2	1.1	9.0	0.9	8.8	0.9
Speech	9.0	1.1	9.0	1.1	9.1	0.9
Mastication	8.9	1.3	8.8	1.3	8.6	1.3
Stability	9.0	1.5	8.7	1.7	8.5	1.7
Self-esteem	9.2	1.3	9.1	1.2	9.0	1.2

SD = Standard deviation. FE = Final examination.

**Table 2.** Relationship between age, sex, rehabilitated jaw, number of implants, splinting, type of attachment and antagonist with the different satisfaction indicators at one month, one year, and at the final examination.

Variable		Indicators of satisfaction											
		Overall		Aesthetics		Speech		Mastication		Stability		Self-esteem	
		Z / X <sup>2</sup>	p	Z / X <sup>2</sup>	p	Z / X <sup>2</sup>	p	Z / X <sup>2</sup>	p	Z / X <sup>2</sup>	p	Z / X <sup>2</sup>	p
Sex: Z	1 month	-0.30	0.76	-1.91	0.05	-0.93	0.35	-2.72	0.01	-1.97	0.04	-1.96	0.05
	1 year	-1.03	0.30	-1.91	0.05	-0.93	0.35	-2.72	0.007	-1.97	0.04	-1.95	0.50
	Final	-1.25	0.20	-1.01	0.31	-0.89	0.37	-2.49	0.01	-2.16	0.03	-1.91	0.05
Maxilla/mandible: Z	1 month	-0.69	0.49	-0.88	0.38	-0.53	0.60	-0.50	0.62	-0.56	0.58	-0.07	0.94
	1 year	-1.47	0.14	-0.64	0.52	-0.53	0.69	-0.49	0.61	-0.55	0.57	-0.06	0.94
	Final	-1.46	0.14	-0.55	0.57	-0.78	0.43	-1.02	0.30	-0.02	0.98	-0.58	0.55
N° implants/Maxilla: X <sup>2</sup>	1 month	6.00	0.05	6.03	0.05	6.02	0.05	6.07	0.05	1.59	0.45	2.31	0.31
	1 year	1.22	0.54	0.20	0.90	0.53	0.76	0.70	0.70	1.12	0.60	0.77	0.68
	Final	0.75	0.68	0.88	0.64	0.57	0.75	0.79	0.67	1.01	0.60	0.62	0.73
N° implants/Mandible: X <sup>2</sup>	1 month	2.46	0.29	4.34	0.11	1.64	0.43	2.74	0.25	7.01	0.03	3.94	0.13
	1 year	2.43	0.29	2.32	0.31	0.56	0.75	3.21	0.20	1.84	0.39	3.28	0.20
	Final	2.00	0.36	0.93	0.61	0.64	0.72	1.89	0.38	1.15	0.56	1.52	0.46
Splinted/non-splinted: Z	1 month	-0.83	0.40	-1.01	0.30	-1.08	0.27	-0.76	0.44	-0.24	0.80	-1.73	0.08
	1 year	-0.88	0.37	-0.24	0.80	-0.98	0.32	-0.82	0.41	-0.32	0.74	-0.72	0.46
	Final	-0.97	0.32	-1.24	0.21	-1.21	0.22	-1.35	0.17	-0.28	0.77	-0.23	0.81
Retainer/single <sup>a</sup> : Z	1 month	-0.36	0.71	-0.46	0.63	-0.37	0.70	-0.02	0.97	-0.73	0.46	-0.24	0.81
	1 year	-0.51	0.60	-0.41	0.67	-1.33	0.18	-1.19	0.23	-1.34	0.17	-0.27	0.78
	Final	-0.34	0.72	-0.87	0.38	-0.96	0.33	-1.64	0.10	-1.88	0.05	-0.52	0.60
Retainer/splinted <sup>b</sup> : Z	1 month	-0.78	0.43	-0.41	0.67	-1.12	0.26	-1.39	0.16	0.94	0.34	-0.40	0.68
	1 year	-0.56	0.57	-0.38	0.70	-1.00	0.31	-1.17	0.24	-0.57	0.56	-1.46	0.14
	Final	-0.20	0.83	-0.90	0.36	-1.00	0.31	-0.23	0.81	-0.29	0.77	-1.13	0.23
Antagonist: X <sup>2</sup>	1 month	0.84	0.84	0.48	0.92	0.70	0.87	2.05	0.56	3.45	0.32	0.64	0.88
	1 year	3.82	0.28	8.32	0.04	5.55	0.13	1.42	0.69	2.1	0.53	2.22	0.52
	Final	4.65	0.19	6.01	0.11	4.60	0.20	1.76	0.62	1.15	0.76	3.91	0.27
N° implants/splinting: X <sup>2</sup>	1 month	2.55	0.76	5.55	0.35	1.93	0.85	3.91	0.56	8.26	0.14	5.73	0.33
	1 year	4.53	0.47	5.62	0.34	1.94	0.85	5.23	0.38	3.00	0.69	4.99	0.41
	Final	7.03	0.21	4.70	0.45	2.50	0.77	5.17	0.39	1.63	0.89	1.79	0.87

NOTES: a only in overdentures with single implants (N=27); b only in overdentures with splinted implants (N=80). Z Mann Whitney test; X2 Kruskal Wallis test.

mastication and stability at 12 months and at the final examination (p<0.05). Patients who had a removable partial denture as antagonist expressed greater satisfaction with the aesthetics of the overdenture at 12 months ( $\chi^2$  8.27, p<0.05), although not at one month or at the final examination (mean 71 months) (Table 2).

**Discussion**

Visual analogue scales (VAS) and categorical scales (CAT) are demonstrated to be valid and reliable instruments (12). In this study we used the VAS, as they are frequently used to measure subjective perceptions (3). We used a scale from 0 to 10 (11), other authors have used VAS with scores from 0 to 100 (3, 13, 14) or from 1 to 5 (5).

Sex had no influence on overall satisfaction; both genders being very satisfied with the IRO; coinciding with studies by Awad et al. (15), Pan et al. (16), and Siadat et al. (17).

There were no significant differences (p>0.05) in the correlation between overall satisfaction and age, both for patients with previous complete conventional prostheses and for those with overdentures; coinciding with MacEntee et al. (3), Heydecke et al. (13) and Siadat et al. (17).

In this study, it was observed that overall satisfaction with the overdentures was greater than with the previous conventional prosthesis, coinciding with other authors (2, 4, 6-8, 10, 11, 13, 16). However, Assunção et al. (9) found no significant differences in the level of

overall satisfaction between patients treated with mandibular IRO's or with complete conventional prostheses at two months of placing the prosthesis. Likewise, they found no significant relationship with comfort, aesthetics, speech, pain, function, phonetics, social relationships and psychological limitations; only stability of the IRO was significantly greater than that of the complete conventional ( $p=0.04$ ).

Overall satisfaction was not significantly influenced by the follow-up period, we obtained a score of 9 points at one month of placement, 8.9 at one year and 8.7 at the final examination, similar to that obtained by other authors (3,5,11,18). MacEntee et al. (3), after assessing 2-implant mandibular IROs, obtained a score of 93 out of 100; Stellingsma et al. (11) on 4, splinted, mandibular implants, obtained a score of 8.9 out of 10 after one year. Zitzmann and Marinello (18) at 6 months follow-up obtained a similar score, 9 points for maxillary overdentures. Timmerman et al. (19) found no significant differences at 96 months mean follow-up. Krennmair et al. (5), after an average follow up period of 59.2 months, obtained a score of 4.8 on a scale of 1 to 5.

Aesthetics, speech, mastication and stability offered similar results to those found by MacEntee et al. (3). Krennmair et al. (5), on a VAS of 1 to 5, recorded a mean score of 4.3 for aesthetics, 4.7 for speech, 4.6 for mastication, and 5 for stability in patients with overdentures retained by 4 splinted implants after a mean of 59 months. In this study, the result for self-esteem was 9 at one month and 8.9 at one year, while Zitzmann and Marinello (18) obtained 8.8 points at 6 months after placement of maxillary overdentures.

Siadat et al. (17), on relating age with comfort, hygiene, attachment, aesthetics, speech, mastication and reported greater satisfaction with aesthetics in older patients. Our study found that increasing age was related to a decrease in satisfaction with attachment at the final examination.

Pan et al. (16) found no significant differences on relating comfort, stability, speech, and aesthetics, to the sex of the patients. Siadat et al. (17) found that men had higher expectations for comfort and were more satisfied with aesthetics, but the difference was not statistically significant. In our study, men were significantly more satisfied than women with mastication and stability at 12 months and at the final examination ( $p < 0.05$ ).

Regarding the location and level of satisfaction, Bergendal and Engquist (20) found no statistically significant differences between the maxilla and mandible, coinciding with this study.

Regarding the number of implants per overdenture, as with Timmerman et al. (19), no statistically significant differences were found for the level of satisfaction and the number of implants. Visser et al. (21) found no significant differences when comparing between two or four mandibular implants. Krennmair et al. (22) also

found no differences in satisfaction between four or more implants in the maxilla.

In this study there were no significant differences in the satisfaction of patients rehabilitated with mandibular overdentures with either splinted or isolated attachments, both groups indicating high levels of satisfaction, coinciding with MacEntee et al. (3) and Karabuda et al. (23). On the contrary, Cune et al. (14) found that patients preferred a mandibular overdenture on 2 bar-splinted implants to those attached on two single balls or two magnets. Timmerman et al. (19), found no significant differences in overall satisfaction between 2 or 4 bar-splinted implants or two single implants, both at 19 months and at 8 years of follow up.

Regarding overdentures with splinted retainers, there was no significant difference between the ball or rider type attachment. Likewise, for single retainers, although satisfaction was greater with the Locator® system (9.1) than the ball type (8.6), this was not statistically significant ( $p > 0.05$ ).

At 12 months follow up, there was greater satisfaction with the aesthetics of the overdenture when the antagonist was a removable partial denture. At the one-month and at the final examination, there were no significant differences in satisfaction with regard to the type of antagonist.

## Conclusions

Patients were much more satisfied with the implant-retained overdentures than with the previous conventional complete dentures.

Patients who received implant-retained overdentures expressed a high degree of satisfaction, both overall and for all indicators (aesthetics, speech, mastication, stability of the prosthesis and self-esteem) independently of follow-up, rehabilitated jaw, number of implants per overdenture, splinted or non-splinted, and the type of attachment. Age did not influence overall satisfaction, although satisfaction with the stability was lower in older patients. Sex had no influence on overall satisfaction, although men were more satisfied than women with mastication and stability.

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