

Benefits of Rehabilitation With Implants in Masticatory Function: Is Patient Perception of Change in Accordance With the Real Improvement?

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This study aimed to compare the index of satisfaction and masticatory function of edentulous patients before and after rehabilitation and to evaluate if patients' perception of the changes in their oral health status is in agreement with the results of masticatory performance test. Fourteen edentulous patients were rehabilitated with lower implant-supported fixed prosthesis and upper removable dentures. Index of satisfaction and masticatory capacity (subjective analysis) and performance test (objective analysis) were evaluated before and 20 days and 8 months after rehabilitation. The patients were asked to respond a yes/no masticatory capacity questionnaire and to rate their oral satisfaction on a 0 to 10 Visual Analogue Scale (VAS). Masticatory performance test comprised the ability of the individual to pulverize an artificial test food (Optocal), after 20 and 40 masticatory strokes. When baseline answers were compared to answers 8 months after treatment, all questions, excepting the ones that considered pain and social disability, were statistically different. Wilcoxon test was used to compare index of satisfaction before and after treatment. All answers showed statistically significant differences, excluding the one that referred to ease of cleaning the prostheses. Considering the masticatory performance test, Student *t* test (normally distributed) and Wilcoxon test (non-normally distributed) were used to test the null hypothesis that the weight of the particles of the test food left in sieves were equal in all times of evaluation. In the larger sieve with 20 cycles, statistically significant differences were observed between baseline and 8 months, 20 days and 8 months. With 40 strokes, baseline and 20 days, baseline and 8 months and 20 days and 8 months showed significant differences. It was concluded that oral rehabilitation leads to better masticatory function in edentulous patients and there is a coincidence between patient perception and real improvement on masticatory function.

Key Words: dental implants, oral rehabilitation, quality of life

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INTRODUCTION

Loss of teeth results in esthetic and functional impairment, leaving people more vulnerable to psychological disorders, low self-perception, and even social exclusion.¹⁻⁴ The quality of diet of these people is also affected, generally presenting low

consumption of vegetables and fruits.⁵ It has been argued that the use of dentures may improve masticatory function and the degree of satisfaction of the patient, restoring dental status as well as self-esteem.⁶

Some methods to quantify changes in functional limitation and disability associated with oral conditions have been validated, such as the Oral Health Impact Profile (OHIP-14) questionnaire⁷ and masticatory performance tests using experimental artificial test food.⁸

Gerritsen et al,⁹ in a systematic review, observed that edentulousness is associated with oral health-related quality of life. In Brazil, edentulousness is frequently associated with socioeconomic factors. According to a recently published epidemiological study¹⁰ comprising a sample of 5349 Brazilians, 40.5% depended on public assistance and 33.1% of them needed full dental prosthesis treatment. This means that many individuals depend on the Public Health Policy to have specialized treatment including complete dentures. Frequently it's difficult to stabilize the denture in the resorbed mandible after long periods without teeth,¹¹ so implant-supported overdentures or fixed prostheses may represent better solutions for restoring chewing function and quality of life of edentulous people.^{12–17}

Since 2003, Brazil's Public Health System has improved dental assistance by the social program "Brasil Sorridente." It was proposed by the State Department of Health, and one of its lines of action is the increase and qualification of specialized attention for the population. Centers of Specialized Dentistry and Laboratories for Dental Prostheses were established, and there is even a suggestion of offering dental implant treatments in these centers in the future.¹⁸ However, it is known that the inclusion of dental implants demands high-cost treatment that would represent a challenge for the Public Health System of Brazil as well as for many other countries. As cited by Petersen¹⁹ one barrier to the organization of global oral health policies regarding older-aged people is the lack of economic resources.

Therefore, considering the importance of adequate oral rehabilitation treatment to improve quality of life, the aim of this study was: (1) to compare masticatory function and impact on the quality of life of edentulous patients before and after oral rehabilitation with upper complete

dentures and lower implant-supported fixed prostheses; and (2) to evaluate if patients' perception of the changes in their oral health status before and after treatment (subjective analysis) is in agreement with the results of masticatory performance test (objective analysis).

MATERIALS AND METHODS

The sample comprised 14 edentulous subjects (10 women and 4 men), mean age of 58.14 years (42–75 years old). All the patients were indicated for treatment at the Latin American Institute of Dental Research and Education and were edentulous for a long time (up to 35 years). All the patients were noninstitutionalized and were responsible for their own meals.

Inclusion criteria included bone availability for implant insertion in the mandible. Exclusion criteria were non-controlled systemic disease and irradiation of head and neck in the last 5 years and use of bisphosphonates, which could interfere with bone remodeling around dental implants.

The study included installation of dental implants and implant-supported prostheses in the lower arch and new upper removable prostheses. The patients were informed about participation in the research and signed an informed consent.

Masticatory capacity

After diagnosis and treatment planning procedures, all the patients were asked to respond a yes/no questionnaire that included some questions based on OHIP-14, considering pain, physical discomfort and psychological disability, together with other specific questions about their diet (Table 1).

Index of satisfaction

The patients were also asked to rate their oral satisfaction on a 0–10 Visual Analogue Scale (VAS; Table 2), that considered patient experience and satisfaction with the dentures, including data about functional limitations, esthetics, and stability.

Masticatory performance

Finally, the performance test, proposed by Slagter et al, that comprised an individual's ability to pulverize an artificial food (Optocal) was carried out.⁸ The patients were oriented to chew 2 portions

TABLE 1

Questionnaire for evaluating masticatory capacity

- | | | | | |
|---|-----|-----|-----|----|
| 1. Are you able to have any aliment with your prostheses? | () | yes | () | no |
| 2. Can you chew everything you eat with your dentures? | () | yes | () | no |
| 3. Can you eat raw carrots, peanuts and meat? | () | yes | () | no |
| 4. Is your diet based on soft food? | () | yes | () | no |
| 5. Have you been a bit embarrassed because of problems with your denture when eating near other people? | () | yes | () | no |
| 6. Have you had painful aching in your mouth? | () | yes | () | no |

TABLE 2

Visual Analogue Scale to evaluate index of satisfaction of the patients



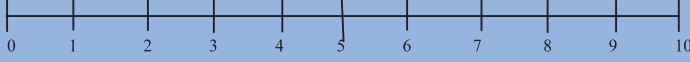
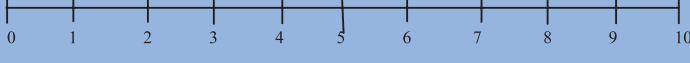

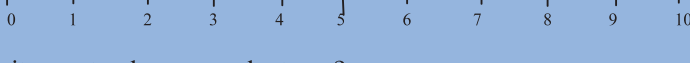
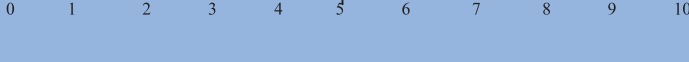
- | | | |
|----|--|--|
| 1. | Are you satisfied with your upper denture? |  |
| 2. | Are you satisfied with your lower denture? |  |
| 3. | Are you satisfied with the stability of your dentures? |  |
| 4. | Are you satisfied with the esthetics of your dentures? |  |
| 5. | Are you satisfied with your dentures when talking? |  |
| 6. | Are you satisfied with your dentures when smiling? |  |
| 7. | Is it easy to clean your dentures? |  |

TABLE 3

Baseline demographic and clinical characteristics of the sample

	Years of Edentulousness	Use Upper Denture?	Use Lower Denture?
Female (n = 10)	16, 5 years (2 months–35 years)	10 yes	9 yes
Male (n = 4)	16 years (7–25 years)	3 yes	3 yes

of 17 cubes (3 cm³) of Optocal, with 20 and 40 chewing cycles. After chewing, the patients were oriented to expectorate the particles chewed into a disposable identified cup, the mouth was rinsed with water, and the rinsing added to the cup. The collected particles were dried and sieved by a system of 8 sieves with different apertures (5.6, 4.0, 2.8, 2.0, 1.4, 1.0, 0.71, and 0.5 mm). The sieves were vibrated for 2 minutes. After this process the contents of each sieve were collected, dried in an oven for 3 hours at 60°C and weighted with the aid of a precision analytical balance with accuracy of 0.0001 g. Cumulative weight percentages were calculated for each sieve of each individual.

The questionnaires were applied by the same researcher in all periods in order to avoid investigator bias when applying the questionnaires.

After the baseline tests (T1), all the patients received new removable upper dentures and five implants in the intermental area followed by immediate fixed-prostheses. The same tests described above were carried out 20 days (T2) and 8 months (T3) months after rehabilitation.

Statistica software (StatSoft Inc, Tulsa, Okla) was used for data analysis.

RESULTS

Demographic baseline data of the patients are described in Table 3.

Masticatory capacity

The percentage of responses according to time is indicated in Table 4. Then a sign test was used to test the null hypothesis so that there was an equal number of responses “yes” and “no” when different times were compared. There was no significant difference for any of the 6 questions when T1 and T2 were compared. Nevertheless, when T1 and T3 were compared, all questions, with the exception of numbers 5 and 6, were statistically significant.

Index of satisfaction

Shapiro-Wilk test showed no normal distribution of the sample data, so Wilcoxon test was used to compare the results obtained with the questionnaires. The results are presented on Table 5.

Masticatory performance

Student *t* test (normally distributed) and Wilcoxon (non-normally distributed) tests were used to test the null hypothesis that the weight of the particles

TABLE 4

Percentage of “yes” and “no” responses to each question

	T1	T2	T3
1. Are you able to have any aliment with your dentures?	Yes 57.14% No 42.85%	Yes 100% No —————	Yes 100% No —————
2. Can you chew everything you eat with your dentures?	Yes 42.85% No 57.14%	Yes 71.42% No 28.57%	Yes 100% No —————
3. Can you eat raw carrots, peanuts, and meat?	Yes 50% No 50%	Yes 57.14% No 42.85%	Yes 100% No —————
4. Is your diet based on soft food?	Yes 42.85% No 57.14%	Yes 28.57% No 71.42%	Yes ————— No 100%
5. Have you been a bit embarrassed because of problems with your dentures when eating near other people?	Yes 21.42% No 78.57%	Yes ————— No 100%	Yes ————— No 100%
6. Have you had painful aching in your mouth?	Yes 50% No 50%	Yes 35.71% No 64.28%	Yes 14.28% No 85.71%

TABLE 5
Obtained results considering time

Variable	μ	P
Are you satisfied with your upper denture?		
T1 × T2	7.07 × 9.07	0.03*
T1 × T3	7.07 × 8.07	0.27
T2 × T3	9.07 × 8.07	0.06
Are you satisfied with your lower denture?		
T1 × T2	2.42 × 9.92	0.0009*
T1 × T3	2.42 × 9.50	0.0009*
T2 × T3	9.92 × 9.50	0.06
Are you satisfied with the stability of your dentures?		
T1 × T2	4.57 × 8.71	0.006*
T1 × T3	4.57 × 8.50	0.007*
T2 × T3	8.71 × 8.50	0.47
Are you satisfied with the esthetics of your dentures?		
T1 × T2	5.35 × 9.64	0.001*
T1 × T3	5.35 × 9.64	0.001*
T2 × T3	9.64 × 9.64	0.99
Are you satisfied with your dentures when talking?		
T1 × T2	5.64 × 9.07	0.004*
T1 × T3	5.64 × 9.42	0.002*
T2 × T3	9.07 × 9.42	0.49
Are you satisfied with your dentures when smiling?		
T1 × T2	5.35 × 9.00	0.005*
T1 × T3	5.35 × 9.71	0.001*
T2 × T3	9.00 × 9.71	0.059
Is it easy to clean your dentures?		
T1 × T2	7.21 × 7.21	0.92
T1 × T3	7.21 × 7.21	0.72
T2 × T3	7.21 × 7.21	0.67

*Statistically significant difference ($P < 0.05$).

left in the sieves were equal in all times of evaluation.

The two first sieves were considered the most representative to evaluate masticatory performance, so the weight of the particles left on the others were not considered for statistical analysis. In the 5.6 sieve with 20 cycles, statistically significant differences were observed between T1 (3.22 g) and T3 (2.04 g; $P = 0.009$), T2 (2.64 g) and T3 (2.04 g; $P = 0.01$). With 40 strokes T1 (2.27 g) and T2 (1.06 g) ($P = 0.03$), T1 (2.27 g) and T3 (0.55 g; $P = 0.001$) and T2 and T3 ($P = 0.03$ g) had significant differences.

In the 4.0 sieve, 20 strokes, for T1 (0.34 g) and T3 (0.6 g; $P = 0.04$) there was a significant difference. With 40 strokes, no significant differences were observed.

Discussion

This paper aimed to evaluate if rehabilitation of edentulous patients with implant-supported prostheses affects masticatory function and how the patients perceived their oral health status before

and after treatment. Two subjective analyses, a questionnaire to evaluate masticatory capacity, a VAS to evaluate index of satisfaction, and a performance test using an artificial test aliment were applied.

The results of masticatory capacity and index of satisfaction showed perception of improvement in oral function after receiving new upper dentures and lower implant-supported prosthesis, mainly in the last period of examination. During the second examination time, 20 days after rehabilitation, all patients commented that they had a better diet but they were still afraid of eating some food and of feeling pain because of the recent implant surgery. The follow-up period was determined as 8 months, which was considered sufficient to get real patient perceptions about the treatment. Shorter times would be implicated in false positive answers, based on initial euphoria with the treatment.

It has been shown that adequate total dentures improve social behavior, but there is less change in relation to diet and comfort.² On the other hand,

patients treated with overdentures reported positive impact on diet, function, and social life.^{15–17} The promotion of oral health should be integrated to general health promotion.²⁰

In a systematic review, Thomason²¹ found some studies comparing many types of rehabilitation in edentulous patients, but did not find enough data to relate the effect of rehabilitation on patient satisfaction and quality of life. Also when comparing the self-perception of the patient and professional evaluation of rehabilitation need, Colussi et al¹¹ observed agreement but could not associate aged persons' perception and satisfaction with esthetics and masticatory function.

However, the subjective nature of the questionnaires⁴ may interfere with the interpretation of the results. Personality traits, gender, socioeconomic level, degree of expectation in relation to treatment, among other factors can interfere with patient responses. So it is important to do a parallel between the results obtained with the questionnaires and more objective tests as masticatory performance. In the present study it was decided to use an artificial test food, Optocal,⁸ which is proven to be reliable and reproducible.

It was observed that after rehabilitation there was statistically significant progressive reduction ($P < 0.05$) in the amount of particles held in the 5.6 sieve after 20 strokes (3.22 g – 2.64 g – 2.04 g) and 40 strokes (2.27 g – 1.06 g – 0.55 g), which means that the patients presented better mastication after rehabilitation. This is in accordance with results of other studies.^{3,13}

Conclusions

According to the obtained results, it can be concluded that:

- Implant-supported fixed prostheses in the lower arch associated with upper total dentures result in better masticatory function and index of satisfaction of edentulous patients;
- There was coincidence between patient perception of improvement on masticatory capacity and index of satisfaction and the improvement in masticatory performance.

ABBREVIATIONS

OHIP-14: Oral Health Impact Profile
VAS: visual analogue scale

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