

# Satisfaction level and masticatory capacity in edentulous patients with conventional dentures and implant-retained overdentures

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## Abstract

The difficulty of totally edentulous individual in performing the basic oral functions in a satisfactory and pleasant way directs the investigations for improvement of the rehabilitation techniques. This study aimed to perform an intra-patient analysis of the satisfaction level and masticatory capacity during the phases of the rehabilitation treatment with osseointegrated implants. Twelve edentulous patients (mean age: 61 years) participated. Satisfaction level and masticatory capacity were analyzed based on specific questionnaires for edentulous patients and by a verbal rating scale from 0 to 10, at three moments: with the old dentures, with conventional new ones after they had been received two osseointegrated implants in the mandible (after 60 days of use). After 5 months of the first surgical phase, gold cap ball attachments were adapted and the last evaluation was performed with the upper denture and the lower overdenture, after 30 days of use. The Friedman test was applied. The rehabilitation with implants produced a significant improvement in the satisfaction level (95.83%) and the masticatory capacity (94.07%). The new full dentures produced a better satisfaction and masticatory capacity than the old dentures. Besides, lower overdenture supported by two osseointegrated implants and a new upper conventional denture produced a higher scores than the conventional new dentures.

## Key Words:

denture, dental prosthesis, implant-supported, patient satisfaction, mastication

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## Introduction

In general, edentulous patients with mandibular bone resorption have difficulties of adaptation to mastication and often report dissatisfaction with their conventional full dentures<sup>1</sup>. For over a hundred years there was only one kind of treatment for this oral condition – conventional dentures<sup>2</sup>. The rehabilitation of these patients by means of conventional full dentures, no matter how perfectly done, could not completely solve their problems, either of functional or psychological order. Besides, between 5% and 20% of the individuals remained dissatisfied after the treatment was concluded. The aesthetics of the upper denture and the lack of stability of the lower one were the main complaints of the patients<sup>3-4</sup>. One of the factors for the dissatisfaction related to the dentures may be attributed to the level of oral perception of each patient, a phenomenon known as oral stereognosis. Patients with a high level of oral perception would be more intolerant to the limitations of full dentures in general<sup>5</sup>. The success of the rehabilitation by means of conventional full dentures is variable, and depends on the capacity of adaptation to treatment limitations. The satisfaction level of the patient is influenced by several factors, including the dentures quality and the plated area, the quality of interaction in the patient-dentist relationship, past experiences with full dentures, and the psychological personality<sup>6</sup>. In harmony, such factors may promote the improvement of the mastication, the speech, and the aesthetics of the teeth, besides producing less discomfort and pain sensitivity, favoring the comminution of harder food<sup>7</sup>. The masticatory functions of these individuals are qualitatively worse in comparison to dentate individual<sup>8-9</sup>. Wearers of conventional full dentures have their masticatory functions reduced between 1/4 (one fourth) and 1/7 (one seventh) when compared to adults with natural teeth, depending on the age and the type of food<sup>8,10-11</sup>. Smith<sup>12</sup> concluded that there was no correlation between the quality of the manufactured dentures and the satisfaction of the patient, but Van Waas<sup>3</sup> and Fenlon et al.<sup>13</sup> have observed a significant association between these factors.

The perception of the patient about oral health conditions has been considered by the prosthodontists as a factor with major relevance at the moment of choice of their treatment. According to John et al.<sup>14</sup>, the index Oral Health Related to Quality of Life (OHRQoL) characterizes a perception of the patients in relation to their oral health. Therefore, this index is able to measure the benefits created by prosthetic treatments. One technically sophisticated way to really measure the OHRQoL is by means of the Oral Health Impact Profile (OHIP), a questionnaire containing 49 items that portrays the different opinions of the patients about the treatment done, including functional, aesthetics, and even psychological questions<sup>15</sup>. Aiming to restrict and reduce the original version of the OHIP, producing an appropriate

specific adaptation for totally edentulous patients, Allen and Locker<sup>16</sup> developed the index Oral Health Impact Profile in Edentulous Adults (OHIP-EDENT).

The improvement of satisfaction, capacity, efficiency, and masticatory performance in patients who were rehabilitated with new upper full dentures and lower overdentures has been reported along the years by several authors<sup>1,6-7,9,17-29</sup>. Besides providing an improvement in the masticatory efficiency<sup>21</sup>, the rehabilitation by means of a conventional denture stabilized by two osseointegrated implants is also responsible for the change in psychological aspects of the patients in relation to their oral condition<sup>30</sup>. In general, the main motivation of the patients who look forward mucous-supported implant rehabilitation is to increase the retention of the lower denture and to improve the masticatory capacity<sup>6,9</sup>. In spite of the existence of articles reporting an improvement in the patient's perception related to masticatory capacity after being rehabilitated with an overdenture<sup>31-32</sup>, it has also been shown that this improvement happens, several times, with individuals rehabilitated with new conventional full dentures only. However, this perception in relation to oral functions, either when they have been rehabilitated with a new lower overdenture or with a new conventional full denture, does not necessarily correlate with the real improvement of their masticatory ability<sup>32</sup>. Patients that are submitted to the treatment with implants have an expectation that their problems with the instability of the denture will be reduced or totally solved. The importance of finding out what the patients really feel after the treatment is, many times, as relevant as the survival rate of the implant or even as the measurement of masticatory functions. Therefore, more attention should be paid to the opinions of the patients about the efficacy of the treatment that the dentist is providing<sup>33</sup>. Therefore, besides the objective tests, subjective tests of the masticatory functions are necessary to check when the treatment is effectively changing the patient's functions. Satisfaction and the masticatory capacity seem to be a combination between factors that are directly related to the proposed modality of treatment and factors not related with the technical part of the treatment<sup>34</sup>. The objective of this research was to perform, by means of a longitudinal prospective study, the intra-patient analysis of the satisfaction level and masticatory capacity of edentulous individuals, applying questionnaires adapted from the indexes OHIP<sup>15</sup> and OHIP-EDENT<sup>16</sup> during the phases of the rehabilitation treatment with osseointegrated implants. The tested null hypothesis was that there would be no statistically significant difference between the proposed ways of rehabilitation.

## Material and Methods

### Selection of Patients

Twelve patients, two males and ten females (mean age 61 years), who voluntarily searched for the services provided

by the Department of Oral Prosthesis and Oral-maxillofacial Surgery, Dental School of Lutheran University of Brazil, Canoas, RS, Brazil, and who were not satisfied with their full dentures, agreed to participate. The experimental design of the study had a prospective trait with longitudinal clinical follow up in patients by means of the convenience sample selection. The following inclusion criteria were adopted: being fully edentulous and user of old conventional removable full dentures for at least 5 years; having an adequate bone height and thickness allowing the insertion of two osseointegrated implants in the anterior region of the mandible between the mental foramina, confirmed by panoramic radiographs, varying from 10 to 15 mm high; not presenting any symptoms of temporomandibular disorder, bruxism, systemic and/or neurological disorders; being non smokers; possessing the ability to understand and to answer properly the proposed questionnaires. The work was approved by the Ethics Committee of the University (protocol 2004-391H). The patients signed the informed consent explaining all procedures that would be done during the research.

*Surgical and Prosthetics Procedures*

Patients received two osseointegrated implants (Replace® Select Tapered; Nobel Biocare™; Gothenburg, Sweden), that were placed in the area between the mental foramina, according to the two-phase standardized surgical procedure<sup>35</sup>. All the surgeries were performed by the same skilled surgeon, who was not aware about the study. After healing of the soft tissues, new conventional full dentures were manufactured for both the upper and the lower jaw, considering the following procedures and materials: balanced bilateral occlusion, in centric relation position; Trilux acrylic teeth (Ruthibras, Pirassununga, Brazil); gingival color selection by the Tomáz Gomes scale (Vipi, Pirassununga, Brazil), and a colorless acrylic palate. All the new dentures were manufactured by the same laboratory technician. Patients started to use the dentures two months after the first surgical

step, keeping it for a two month-period without the connection of the abutments. The second surgical phase was done 5 months after the insertion of the implants. Two small incisions were done to expose the head of the screws, and the 2 mm high ball abutments (Ball Attachment®; Nobel Biocare™; Gothenburg, Sweden) were placed with a 15 N torque. By means of the gold cap ball attachments, the lower denture was connected to the ball abutments, performing a clinical capture procedure.

*Satisfaction level and masticatory capacity*

The satisfaction level and the masticatory capacity were evaluated by means of the questionnaire I (Table 1) and questionnaire II (Table 3) with the old dentures – at least 5 years of use (before the first surgical phase), with the new dentures (after the first surgical phase - 60 days of use), and during the phases of the rehabilitation treatment with osseointegrated implants). Thus, the questionnaires were applied to verify the patient’s satisfaction perception and the masticatory capacity facing the proposed treatment.

The patient answered the questions about the ability or lack of ability to comminute hard and soft foods, relating it with the discomfort and instability of the dentures, with perception of satisfaction in relation to the aesthetics, to the pleasure when eating, to the level of comfort, and to the assurance with them. The questionnaires were provided by one evaluator only, being this in charge only for the elucidation of possible doubts that could arise along the answers, therefore not

**Table 2** – Verbal Rating Scale (VRS) for general satisfaction level

*Considering the quality offered by your dentures (comfort, self-assurance and esthetics or appearance), please, give a classification from zero (0) to ten (10) of your general satisfaction level in relation to your oral conditions.*

Classification: \_\_\_\_\_

**Table 1** - Questionnaire I – Questions about satisfaction level with the dentures

Questions	0	1	2	3	4
1 How do you feel about the pleasure you get from food, compared with the time when you had natural teeth?	<input type="checkbox"/>				
2 With respect to chewing, how satisfied are you with your dentures?	<input type="checkbox"/>				
3 With respect to appearance, how satisfied are you with your dentures?	<input type="checkbox"/>				
4 With respect to how comfortable your dentures are, how satisfied are you?	<input type="checkbox"/>				
5 With respect to being self-assured and self-conscious, how satisfied are you with your dentures?	<input type="checkbox"/>				
6 With respect to your social and affective relationships, how satisfied are you with your oral conditions?	<input type="checkbox"/>				
7 With respect to your professional performance, how satisfied are you with your oral conditions?	<input type="checkbox"/>				
8 With respect to eating, how satisfied are you with your dentures?	<input type="checkbox"/>				
9 Are you satisfied with your smile (esthetic)?	<input type="checkbox"/>				

**Table 3 - Questionnaire II - Questions about masticatory capacity**

Questions	0	1	2	3	4
1 Have you ever had to interrupt meals because of problems with your dentures?	<input type="checkbox"/>				
2 Have you found it difficult to chew any foods because of problems with your dentures?	<input type="checkbox"/>				
3 Do you need any special food preparation to enable chewing (such as cooking, cutting into small parts, humidification)?	<input type="checkbox"/>				
4 How stable are your dentures when eating foods of a certain consistency?	<input type="checkbox"/>				
5 Do you need force to swallow foods after chewing?	<input type="checkbox"/>				
6 Do you think that you are swallowing large pieces of food due to the lack of proper fragmentation?	<input type="checkbox"/>				
7 Have you found it uncomfortable to chew any foods with your dentures?	<input type="checkbox"/>				
8 Have you ever had to interrupt meals because of problems with your dentures?	<input type="checkbox"/>				
9 In comparison with other people, do you perceive that you take longer to chew the foods during meals?	<input type="checkbox"/>				
10 Do you feel uneasy during meals due to the lack of denture security and instability?	<input type="checkbox"/>				
11 Have you been embarrassed when eating with other people during meals?	<input type="checkbox"/>				
12 Have you been irritable when having meals with other people?	<input type="checkbox"/>				
13 Have you been totally unable to function because of problems with your dentures?	<input type="checkbox"/>				

**Table 4 – Verbal Rating Scale (VRS) for general masticatory capacity**

*Taking into account your answers and your capacity to chew several food types, from soft to hard, please, give a classification from zero (0) to ten (10) for your general masticatory capacity in relation to your oral conditions.*

Classification: \_\_\_\_\_

interfering with their contents. The application of the questions started when the patient was comfortably sat in the chair. Individuals were invited to express their opinions about the conditions of their dentures through nine questions of the Questionnaire I, in a scale ranging from 0 (zero) to 4 (four), where 0 represents the total satisfaction and 4 represents the total dissatisfaction.

In the Questionnaire II, composed by thirteen items, the masticatory capacity was provided by the patient in a scale from 0 (zero) to 4 (four), where 0 represents never (no problems) and 4 represents always (with problems)<sup>16</sup>.

The means scores were calculated. The higher scores represented a poor perception of the oral conditions, therefore worse satisfaction levels and masticatory capacity.

After applied the questionnaires, patients were also asked to give a score from 0 to 10 by a verbal rating scale (VRS) or the satisfaction level (Table 2) and for the masticatory capacity in general (Table 4), where 0 (zero) represents very bad and 10 (ten) means excellent. After the data collection, the mean scores among the patients were calculated. The results mean the general satisfaction level and general masticatory capacity.

*Statistical Analysis*

For questionnaire I the maximal punctuation was 36,

considered as 100% of the total dissatisfaction, and for questionnaire II the maximal punctuation was 52, considered as 100% of improper masticatory activity. After the patient’s scores had been computed, the correspondent percentages were calculated, and subtracted from 100% in order to facilitate the interpretation of the results. Consequently, the largest percentages presented in the results mean better satisfaction level and masticatory capacity. For general satisfaction level and masticatory capacity, the VRS mean values were considered.

The data were analyzed by descriptive statistic (percentages, means, and standard deviation). The normality of the distribution was verified by the Kolmogorov-Smirnov test. Questionnaire scores intra-patients, in percentage, were compared in the three distinct moments (old dentures, new dentures, and lower overdenture) by using Friedman non-parametric test. The statistic software SPSS version 10.0 was used for the processing and analysis of these data. The significant level was considered at  $p < 0.05$ .

**Results**

None implant was lost nor it was any inflammation detected in the perimplantar region. In two patients only the second phase surgery had to be done again due to a small gingival hyperplasia that interfered in the clinical capture of the lower denture’s female.

The null hypothesis was refused, since patients with old full dentures achieved, in average, a lower satisfaction level than with the new dentures, following by the overdentures. It was also observed that the difference was statistically significant among the three types of dentures at different times. The same was observed on comparing the three used dentures, the lower and upper olds, the new ones, and the lower overdenture with variation statistically significant (Figure 1). Results related to the masticatory capacity behaved in a similar way with statistical significant difference

among the three types of dentures (Figure 3). The mean VRS scores for the satisfaction level and masticatory capacity in general increased significantly from the first to the last evaluation (Figures 2 and 4).

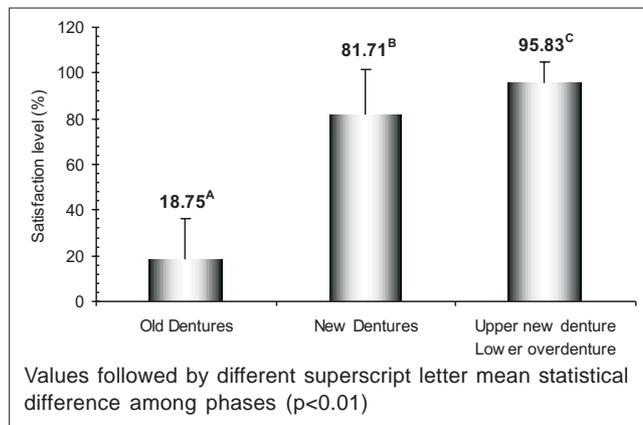


Fig. 1 - Means and standard deviation of the satisfaction level (%) among the three evaluation phases

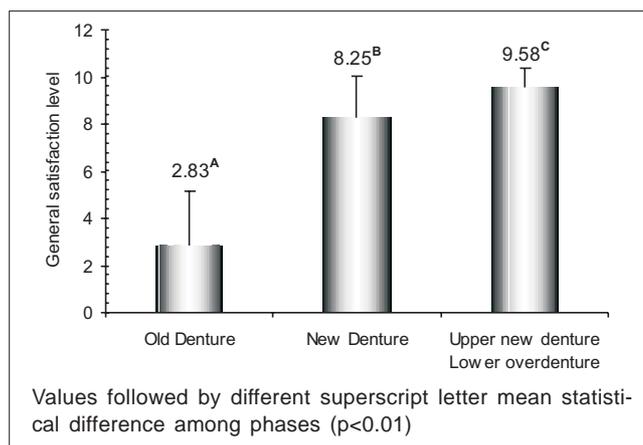


Fig. 2 - Means and standard deviation of the general satisfaction level among the three evaluated phases (scores 0-10)

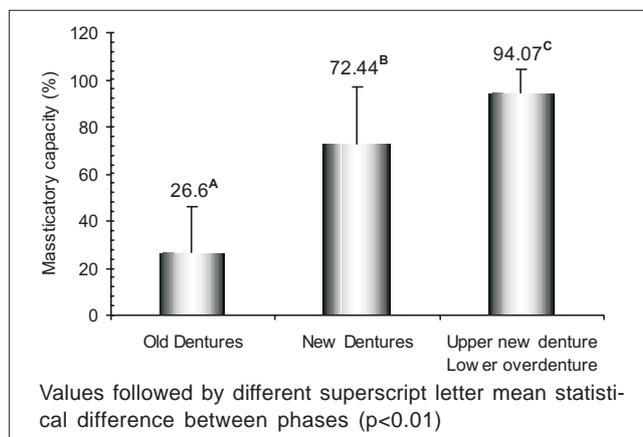


Figure 3 - Means and standard deviation of the masticatory capacity (%) among the three evaluation phases

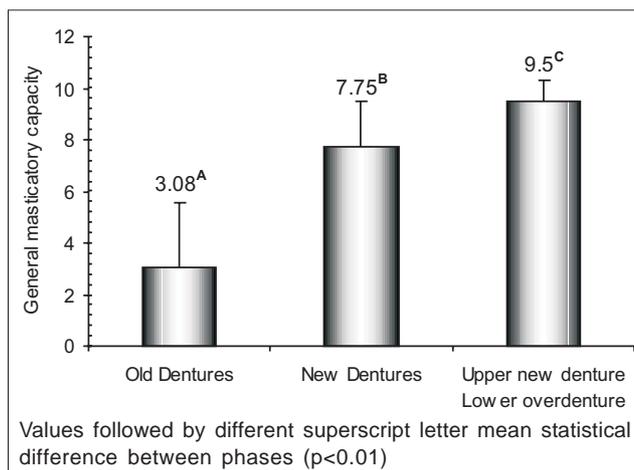


Fig. 4 - Means and standard deviation of the general masticatory capacity among the three evaluation phases (scores 0-10)

### Discussion

The patients rehabilitated with a lower overdenture and a new upper conventional full denture showed more favorable results in terms of satisfaction and masticatory capacity than when they have been worn the old and new dentures (Figures 1 and 3). The treatment of edentulous individuals with a lower overdenture appears to be very efficient in relation to the reduction of problems originated from the conventional dentures<sup>36</sup>. Based on the results, we observed that the satisfaction and the masticatory capacity were related to the comfort and the stability of the denture, with improvement on chewing and speaking ability and on the aesthetics.

The selection of a sample by convenience could determine overestimate results, but we considered not viable to blind the patients to the treatment in this study, as they were looking for the improvement of their dentures. The amount of remaining bone tissue, despite the bone height and thickness properly for lower implants, and the capacity of adaptation with the old dentures (oral stereognosis) were reduced. Therefore, unconsciously the patients had the feeling that the rehabilitation with the osseointegrated implants, theoretically at the end of the treatment, would be the best kind of rehabilitation. Patient's preferences for a particular form of treatment must be taken into account in clinical trials<sup>37</sup>. It has been proposed that emotional responses following assignment of treatments, which may or may not be preferred, will strongly influence the outcomes, especially when they are based on self-reports of treatment satisfaction<sup>38</sup>. Thus, in order to reduce possible biases we provide to the subjects the same surgical procedures, dentures, and overdentures, making individual evaluations at three different times, being each one the control of him/herself.

The satisfaction level and the masticatory capacity increase with the rehabilitation by means of the osseointegrated

implants, agreeing with others<sup>2,6-7,22,24-29,38-39</sup>. The new dentures manufactured with a higher aesthetic quality, due to the better quality teeth, gingival part characterized according to the Tomáz Gomes scale, and with a perfect determination of the plated area – were factors that may have influenced the patients to provide higher scores of the questionnaires in relation to the time of the old dentures, even before the benefit of the anchoring by implants. Moreover, after this time, using lower overdenture, the patient scores were higher comparing with the first and second evaluations.

In several studies patients who received two implants had less difficulty to eat harder and more consistent foods, in relation to those who did not receive them<sup>6,26,31</sup>. In the present work, we also observed an improvement on the masticatory capacity after rehabilitation with implants (Figure 3), showing that the application of the adapted questionnaires was reliable, as found by Awad et al.<sup>37</sup>. Nevertheless, Cune et al.<sup>28</sup> have reported that, with the analysis by means of a visual analogue scale (VAS), they were able to better represent the perceptions of the patients in relation to the scale by scores. The study of Heydecke et al.<sup>25</sup> showed that the patients with the overdenture had a higher improvement in the OHRQoL than the patients rehabilitated with the conventional dentures. In this study it was used the VRS, since Cork et al.<sup>40</sup> demonstrated that the VRS is a simple instrument that can save time and compares favorably to the VAS. All patients showed an improvement in the satisfaction level and masticatory capacity after the treatment with osseointegrated implants. There was a statistically significant difference between the studied groups, but some particular patients obtained results with smaller differences between the old and new dentures, probably associated to the short time of use that could lead some problem of adaptation. Meijer et al.<sup>26</sup> believe that the satisfaction improves as the time of adaptation increases, having observed this in a 10 year-follow up study.

Concluding, the rehabilitation of totally edentulous patients by means of two osseointegrated implants placed in the region between the mental foramina, supporting a full denture by means of spherical abutments, satisfied better the patients in relation to conventional full dentures. In the same way, an increase of the masticatory capacity of edentulous patients who were rehabilitated with new full dentures supported by implants was observed.

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