

COMPARATIVE ANALYSIS OF THE MASTICATION ABILITY OF DENTULOUS AND EDENTULOUS PATIENTS REHABILITATED WITH COMPLETE DENTURE

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Received on: August 24, 2004.
Accepted on: April 22, 2005.

MATIELLO, Milena Nahás; SARTORI, Ivete Aparecida de Mattias; LOPES, José Fernando Scarelli. Comparative analysis of the mastication ability of dentulous and edentulous patients rehabilitated with complete denture. *Salusvita*, Bauru, v. 24, n. 3, p. 377-392, 2005.

ABSTRACT

The rehabilitation of the edentulous patients is a great concern to dentists. Many studies have mentioned the mastication ability decrease of this type of patients. More recent studies have defined the mastication ability as: satisfaction level (SL), capacity (MC), efficiency (ME) and chewing performance (CP). This study was designed with the aim to compare the mastication ability of edentulous and dentulous patients: 10 edentulous patients rehabilitated with complete dentures of the Universidade do Sagrado Coração – Bauru and 10 dentulous patients varying from 41- 64 years old participated. For the test of the ME, the patients chewed almonds until they felt that they were ready to be swallowed and also in a period of 10, 20 and 40 seconds. The content was collected and placed in a sieve system, using sieves with openings of different diameters, and the ME rated as excellent, good, regular, bad and terrible through a pre-established classification. For the test of CP a food simulator

was used, the patient being counseled to perform 40 chewing cycles, using the same sieve system. The capacity was valued from data furnished by the patients as well as the satisfaction level, through a questionnaire. The dentulous patients presented 92.5 % of ME, 97.5% of MP, 100% of MC and 99.5% of SL, whereas the edentulous patients presented 25 % of ME, 17.5% of CP, 57.86% of MC and 67% of SL. The patients that wear complete denture presentd lower ch ewing capabilities than the dentulous patients.

KEY WORDS: total prosthesis; edentulous mouth; mastication

INTRODUCTION

Morphological and physiological alterations, local or systemic, that are common in the elderly, such as decrease of motor coordination, decrease of saliva production and a more marked reabsorption of the alveolar bone rim require dental treatment that take these conditions in consideration and comply with the needs and expectation of these patients (MARCHINI et al., 2001). Studies reveal that age is but one factor associated to loss of masticatory performance (WAYLER; CHAUNCEY, 1983; CARLSSON, 1984; FONTIJN-TEKAMP et al., 2000). However, age, associated to local or systemic diseases that lead to teeth loss, muscle pathologies or pain that can be blamed for decrease in the masticatory function.

Michael et al. (1990), related that the maximum biting force in patients rehabilitated with total prosthesis is 4.5 times weaker than that in healthy individuals with normal dentition. Also, studies in nutrition show that adults with total prosthesis have a diet poor in fibers and vitamins. Reason for that is the difficulty of mastication of hard food, such as vegetables and fruits, and a decrease in taste (ALLEN; McMILLAN, 2002).

The masticatory performance (MP) is the ability of the masticatory apparatus to fragment a given volume of food or a food simulator, in a given number of masticatory cycle in a given period. Such tests can be run with foods such as peanuts, nuts, coconut, carrot, gelatin, hazel, nut, chestnut and others or an artificial product that simulate some most of food, such as casting silicone. The material is collected and than sifted in a sieving system with varying screening abilities.

The masticatory efficiency (ME) is evaluated by observing whether or not the time of mastication, the amount of masticatory cycles and the size of the food particles resulting from the masti-

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cation are enough for the deglutition of this food. The food is chewed by the patients until they are ready to swallow. Then, the food is spittled and sifted. The values obtained by sieving the fragmented food help to evaluate masticatory efficiency.

The masticatory capacity (MC) is obtained from the direct answer (yes or no) by the person to the questions regarding the capacity that the masticatory apparatus, or prosthesis, has to fragment the foods, with or without difficulty. It is also asked if the patient can or can not fragment a given food.

The satisfaction level (SL) for the present oral conditions is also obtained by answering questions about the comfort, safety and capacity to chew different types of foods and on the aesthetics of their own stomatologic system, natural or with prosthesis (CARVALHO, 2002).

The available functional size of the occlusal surfaces, the shape of cuspides, the number of antagonist teeth and the quality of their contact when in occlusion, the tongue, lips and cheeks are physical and functional factors that can interfere directly in the quality of food mastication.

Considering the importance to know the quality of the rehabilitations that are being performed, the aim of the present study is to conduct a comparative quantification between dentulous and edentulous patients rehabilitated with total prosthesis, by means of the assessment of the level of satisfaction and the masticatory capacity, efficiency and performance.

MATERIALS AND METHODS

For this study 10 total edentulous patients were chosen from the clinic of the Dentistry Program of the University of the Sacred Heart – Bauru with age varying from 41 to 64 years old, being half males and half females, and other 10 dentulous patients up to the second molar with normal occlusal pattern, with age varying from 43 to 64 years old, being 4 males and 6 females (FIGURES 1 and 2). As pre-requisite, patients must be physically and psychologically healthy and be wearers of comfortable and functional total dentures. They were fully informed on the research and signed an informed consent authorizing the proposed procedures and the publishing of results.



FIGURE 1– Dentulous patient (Group D). Age range – 41 to 64 years old.



FIGURE 2 – Edentulous patient with a pair of total prosthesis (group E). Age range – 43 to 64 years old.

Two questions were used to assess the level of satisfaction and masticatory capacity (FIGURE 3). The masticatory capacity came clean by the patient's answers (yes or no) in a maximum of 70 points and the level of satisfaction similarly varied on a scale from 0 to 10.

To assess the masticatory efficiency a modification was introduced in a method proposed by Helkimo et al (1977) and nuts were used as test food instead, and as well as a system of sieves with orifices of different sizes, which was also modified by Carvalho (2002) (FIGURES 4 and 5).

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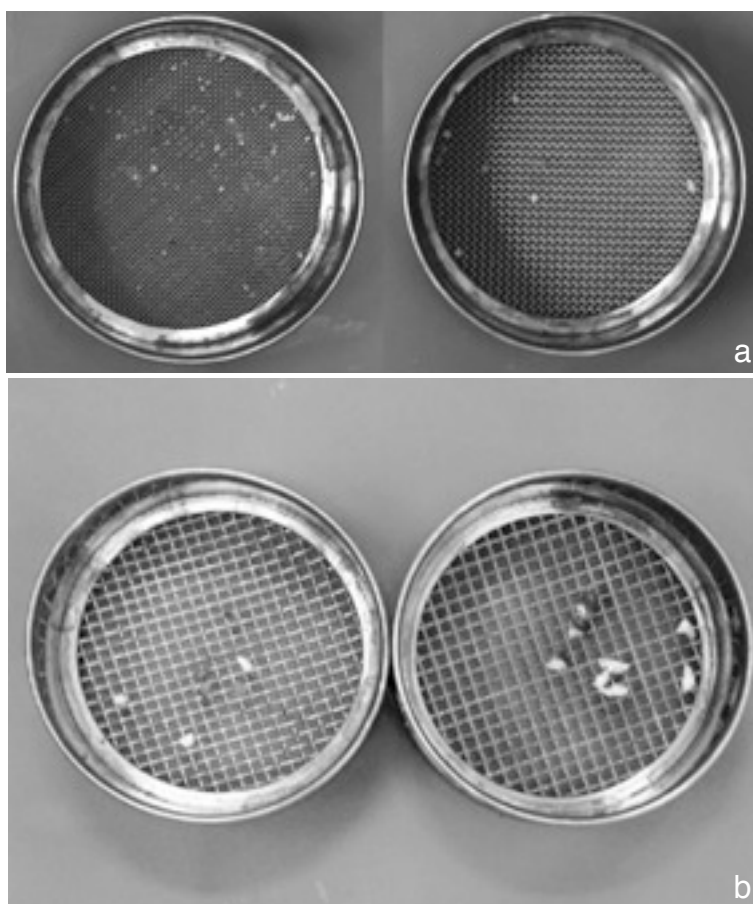
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FIGURE 3 – Evaluation of the masticatory efficiency – nuts as test food.



FIGURE 4 - System of silk sieves with orifices measuring 1.2, 2.83, 4 and 4.75 mm.



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FIGURE 5a – Particles produced by an edentulous patient after 20 seconds, in the sieve of 1 and 2 mm/ FIGURE 5b – Particles produced by an edentulous patient after 20 seconds, in the sieve of 1 and 2 mm

The masticatory efficiency was classified in 5 categories:

– *very good (ME1)* – absence of particles greater than 4.75 mm and presence of a few particles greater than 4 mm after fragmentation of the nut for 10 seconds.

– *good (ME2)* – the same as above after 20 seconds.

– *mild (ME3)* – presence of a few particles greater than 4.75 mm or 4 mm after fragmentation for 20 seconds.

– *bad (ME4)* – patients do not fit in the three previous categories, but do not have 4.75 mm particles after 40 seconds of mastication.

– *very bad (ME5)* presence of 75 mm particles after fragmentation for 40 seconds (FIGURE 6).

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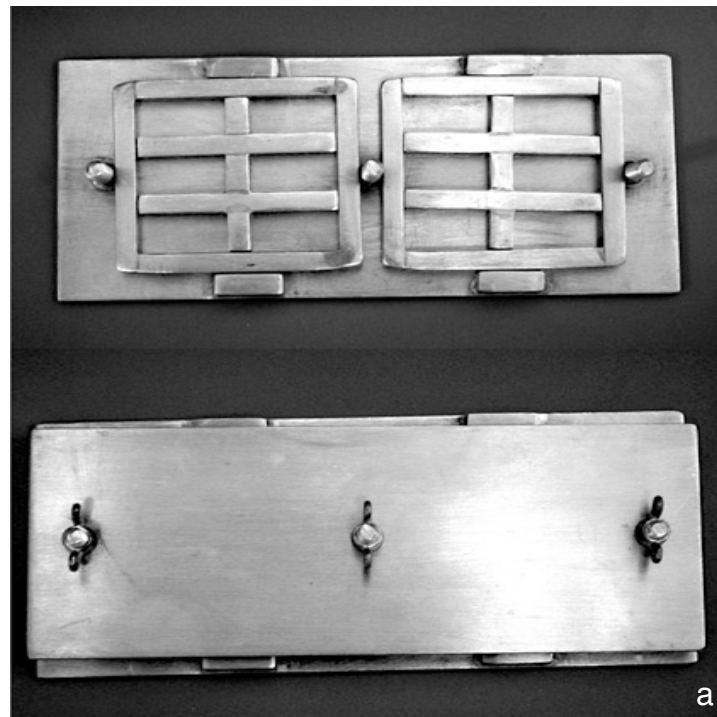


FIGURE 6a – Matrix of the condensation silicone tablets, open and closed, used for masticatory performance.

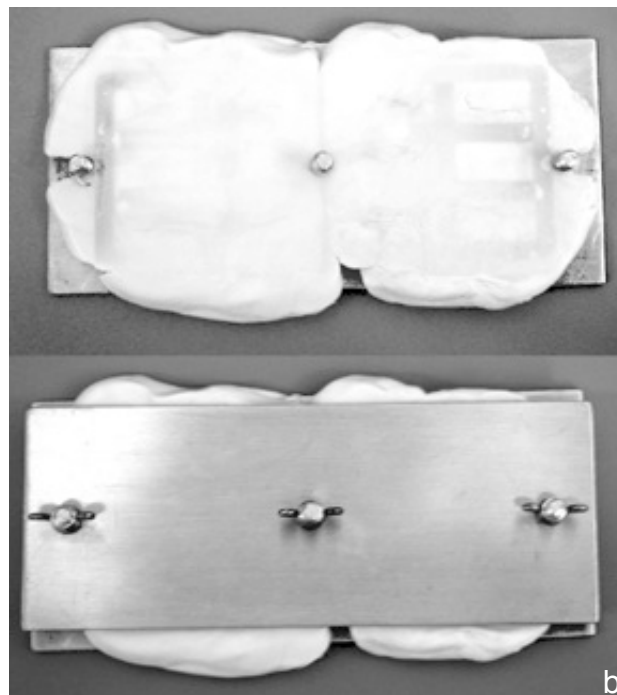


FIGURE 6b – Condensation silicone pouring out of the matrix.

The masticatory performance was assessed by the amount and size of particles after chewing Silon tablets 40 times and a system of sieves with orifices of different sizes (FIGURE 7). Each Silon tablet was an hexaedre-shaped device measuring 0.5 cm X 1.0 cm X 2.0 cm with a volume of 1.0 cm³ and average weight of 1.61829 g, varying from 1.57400 g to 1.69270 g (FIGURE 8). After completing the requested chewing cycle the patient spitted the chewed material into a recipient. It was necessary to rinse the mouth with water to remove all the fragments. The Masticatory Performance was rated in 5 categories:

– *Excellent masticatory performance (MP1)* absence of 4.75 mm and 4 mm particles.

– *Good masticatory performance (MP2)* absence of 4.75 mm particles and presence of particles of 4 mm ones.

– *Moderate masticatory performance (MP3)* presence of 4.75 mm particles less than 20% of the total.

– *Bad masticatory performance (MP4)* presence of 4.75 mm particles greater than 20% and less than 50% of the total particles.

– *Very bad masticatory performance (MP5)* presence of 4.75 mm particles greater than 50% of the total. (FIGURE 8).

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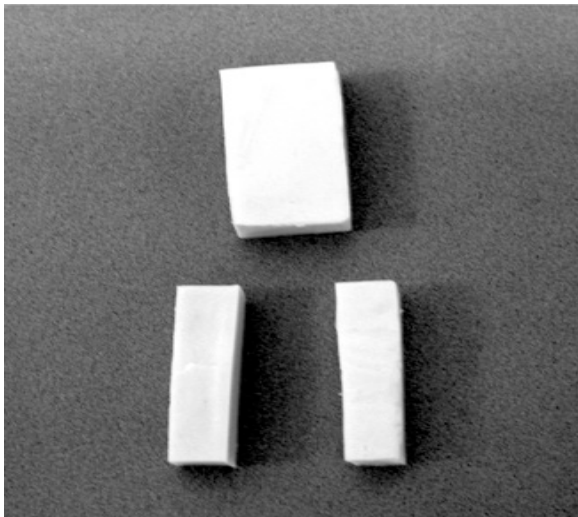


FIGURE 7 - Condensation silicone (silon) cut to facilitate in half fragmentation.

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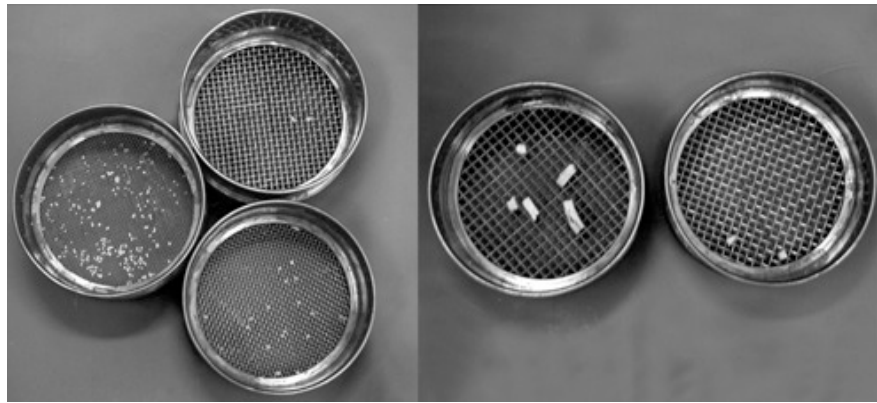


FIGURE 8 – Particles produced by two patients (one dentulous, one edentulous) fragmented 40 times.

RESULTS

The Mann Whitney Test was employed with two independent samples, dentulous (D) and total prosthesis patients (E).

In relation to ME, dependent variable, the result showed statistical significance, exact probability = 0.000044. Considering excellent ME 100%, the group D scored 92.5% of its ME and the group E 25%.

In relation to MP, dependent variable, the result did not show statistical significance with exact probability = 0.000010. Considering excellent MP at 100%, the group D scored 97.5% of its MP and the group E 17.5%.

In relation to MC, dependent variable, the result bore statistical significance, exact probability = 0.000206. Considering excellent MC totally satisfactory at 100%, the group D scored 100% of its MP and the group E 57.86%.

In relation to SL, dependent variable, the result was also with statistical significance, exact probability = 0.011496. Considering excellent SL totally satisfactory at 100%, the group D scored 99.5% of its SL and the group E 67% (TABLE 1).

TABLE 1 – Results from masticatory abilities for dentulous (D) and edentulous (E) patients.

Pacient	Sex	Group	PS	ME	MP	MC	SL	Age
A	M	D	1.6016	1	1	70	10	56
B	F	D	1.6826	1	1	70	10	57
C	F	D	1.6223	2	1	70	10	54
D	M	D	1.5740	2	1	70	10	41
E	F	D	1.6239	1	1	70	10	49
F	F	D	1.5935	2	1	70	10	47
G	F	D	1.5871	1	1	70	10	64
H	F	D	1.6193	1	2	70	10	54
I	M	D	1.6342	1	1	70	10	54
J	M	D	1.6927	1	1	70	9,5	45
L	F	E	1.6259	3	5	70	10	51
M	M	E	1.6158	3	5	55	10	45
N	F	E	1.6237	5	5	0	3	51
O	M	E	1.6366	5	5	50	10	54
P	F	E	1.5904	5	5	25	5	43
Q	M	E	1.6306	2	4	50	6	45
R	M	E	1.5365	5	5	25	5	64
S	M	E	1.6183	3	3	45	4	44
T	F	E	1.6249	4	5	40	6	50
U	F	E	1.6319	5	5	45	8	62

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DISCUSSION

The patients' need for more total prosthesis stability and retention is in the origins of the study of many techniques and materials and use. However, total satisfaction has not been reached in mastication, comfort and safety when compared to a dentulous patient.

The sample was not large due to the difficulty to include edentulous patients in the same age range with a pair of total prosthesis and dentulous patients up to the 2nd molar with normal occlusal pattern, in addition to gender separation. However, it was enough to guarantee adequate statistical analysis.

It is observed in many studies that hard foods are constant in the test. It is important to stress that the real problem for total prosthesis

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wearers is this type of food. Indeed, the fact that these patients tend to select soft foods for consumption (ALLEN; McMILLAN, 2001; HATCH et al., 2001) remains uncontested. If the test contained only soft foods the numerical analysis would not be that much discrepant. Other studies have showed association between masticatory performance and maximum occlusal force (FONTIJN-TEKAMP et al., 2000; OKIYAMA et al., 2003). However, it was not determined if the individual masticatory performance varies according to the hardness of the food, which seems to be true. This could be a reason for patients to instinctively select foods. The hard ones take additional effort to be broken. Greater force leads to greater difficulty and more soft tissues lesions. Such information supports other studies that report up to 75% of total prosthesis wearers chewing only soft foods (ALBREKTSSON et al., 1986).

MC was 100% satisfactory in the dentulous group and it was 57.89% in the total prosthesis users group (average note = 40.5). SL was 99.5% in the dentulous group and 67% in the group rehabilitated with total prosthesis.

In spite of the statistical different values found for masticatory capacity and the level of satisfaction between the two groups it is noted that, due to the subjective nature of the data, the differences are minor. If it is taken into consideration that in the group rehabilitated with total prosthesis the masticatory efficiency was 25% and the performance was 17.5%, it should be considered the level of satisfaction of 67%, which is comparatively high. This may lead to the hypothesis that the patient believes to be in better shape than they actually are (performance and efficiency). To consider the period of time in which the patient has been edentulous can be another parameter of investigation that could suggest the need of other studies. Another factor that may interfere in the results is the characteristic of the residual rim: basal area, form and volume. In the present study this information was not covered and is a factor already associated to masticatory efficiency (KOSHINO et al., 2002). As criteria for patient selection applied only to age range, this variable was not included but could be considered in future studies.

CONCLUSION

Based on the results of the present study it is possible to conclude that the masticatory abilities of edentulous patients with a pair of total prosthesis is rather reduced when compared to dentulous patients of the same age range.

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ANNEX 1

QUESTIONNAIRE 1 – Assessment of masticatory capacity (cm).

Name: _____

Date of birth: ____/____/____.

Place: _____

Status: () married; () single; () separated; () widow.

Do you have children? () no; () yes. How many? _____

Address: _____

CEP: _____

City: _____ Phone(s): _____

Occupation: _____ Company: _____

Position: _____ Phone(s): _____

1 – Are you unable to chew any food that you would like to eat?

() no () yes.

Which sort? () solid () paste () liquid

() hard () soft () sticky () dry () humid

Why? (Pain? Does the prosthesis move? Does it take long to chew the food?)

2 – Which type of food do you feel it is more difficult to chew?

3 – Do you require any special preparation in aliments before eating in order to be able to chew them? (cook, chop in smaller pieces, hydrate)

() yes () no

What you need to do? _____

4 – Can you normally chew the foods mentioned below?

A – fresh carrot () yes () no

B – lettuce () yes () no

C – chopped meat () yes () no

D – cooked vegetables () yes () no

E – red meat steak () yes () no

F – chicken, fish () yes () no

G – apple, pear, guava () yes () no

5 – Does it difficult to swallow aliments after chewing?

() yes () no

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6 – Do you believe you are fragmenting (masticate) foods into pieces small enough to swallow them?

yes no

7 – Do you chew using all teeth of your prosthesis?

yes no Edentulous

8 – Do you chew only in one side?

yes no Dentulous

Only on the left side

Only on the right side

Only with the anterior teeth

Only with the posterior teeth

Why are you not able to chew with all your teeth? Does the denture move? Does the gum hurt? Is there any specific side that you can not chew on?

Even using only one side is your mastication satisfactory?

yes no

9 – Comparing to other people do you take more time to chew food?

yes no

10 – Are you happy with the time you take to chew your meals?

yes no

Why? _____

11 – Do you avoid eating with other people?

yes no

Why? (Noisy denture? Fear of a dropping denture? Take too much time to chew and swallow? Other reasons?)

12 – Based on the above answers and taking into consideration your capacity to chew different foods, soft and hard, score from 0 to 10 your Masticatory Capacity (MC): _____.

The masticatory capacity can vary from 0 to 70 according to the results of it yes and it no.

QUESTIONNAIRE 2 – Evaluation of the Satisfaction Level (SAT)

1 – Do you believe that your eating pleasure has changed if compared to your previous situation?

yes no

2 – Are you happy with your present masticatory condition?

yes no

3 – Are you happy with your present dental or denture aesthetics condition?

yes no

4 – Are you happy with your present comfort conditions with your teeth or denture?

yes no

5 – Are you happy with your present safety and reliability condition in what regards your denture?

yes no

6 – Is your affective life affected in any way by your present oral condition?

yes no

7 – Is your professional life jeopardized by your present oral condition?

yes no

8 – How would you rate your mastication?

excellent – chew any food without restrictions.

good – restrictions to some foods. No reported discomfort.

Regular – restriction to some foods, it is bothering, but does not interfere in the affective or professional life.

Bad – restriction to many foods, interfering not only in feeding but in the affective and professional life too.

9 – Based on the quality of your prosthesis, rate from 0 to 10 its aesthetics: _____.

10 – How old were you when you lost your teeth? _____ years old.

11 – How old were you when you started using prosthesis? _____ years old.

12 – Did you feel frustrated for having to use prosthesis?

yes no

How? _____

13 – Based on the quality of your prosthesis (masticatory capacity, comfort, safety and aesthetics) rate from 0 to 10 your Level of Satisfaction with your present oral conditions (SAT): _____.

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