

CHEWING ALTERATIONS IN REMOVABLE DENTAL PROSTHESIS USERS: SYSTEMATIC REVIEW

Alteraciones de la masticación en usuarios de prótesis dental removible. Revisión sistemática

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ABSTRACT

In aging process, the tooth loss leads to the need of dental prosthesis use. There are specifically alterations in mastication process in denture-users not only in relation to morphofunctional structures, but also in chewing and its functionality satisfaction standard. This review aims at compiling and analyzing scientific articles on the relationship of chewing and removable dental prostheses in adults and older adults. An integrative search of SCIELO, PUBMED and LILACS databases was conducted, covering a period from 2005 to 2014. The review included studies to identify the relations in the use of removable dentures and chewing in adult. The review presented 21 potential articles and after applying inclusion and exclusion criteria 11 were selected. Satisfaction, performance, efficiency and masticatory parameters constituted the most affected variables related to removable dental prosthesis users.

KEYWORDS: Aging; Dental Prosthesis; Mastication; Speech, Language and Hearing Science

■ INTRODUCCIÓN

Aging is a dynamic process with morphological, biochemical, functional and psychological changes¹ that involves social and cultural variables². Such changes also occur in the oral cavity and interact with support tissues diseases and stomatognathic structures¹, affecting skull-cervical adaptation and development³.

Tooth loss is one of the causes of oral cavity alteration in senescence⁴, causing stomatognathic system homeostasis disruption due to changes in the facial skeleton, loss of alveolar bone and neuromuscular response, which interferes with chewing, swallowing and speech functions performance^{1,5-7}.

Removable denture serves to replace missing teeth in edentulous patients⁸. Authors⁹⁻¹¹ describe that the use of these elements as maybe cause of dental functional modifications, which generate chewing adaptation, and, in many cases, lead to prosthesis disuse. This is due to the fact that any

type of denture might cause inevitable variations in oral environment, requiring tissue adaptation to a new condition. Oral prosthesis characteristics influence organism reaction mode and ability¹².

According to a study in the city of Santiago de Chile, the prevalence of edentulism in subjects over 65 years is 33.84%, a significant figure to be considered since in 2002 the public health services implemented oral rehabilitation with 18,245 removable prosthesis¹³. Other research verified that around 51.2% to 75.8% of older adults make use of some kind of dental prosthesis¹⁴.

Masticatory efficiency of removable dentures users reaches approximately 30% of chewing ability compared to natural dentition⁴ and an investigation determined that removable dental prosthesis use leads to a low fiber and less nutritious diet¹³. Studies concluded that the percentage of the masticatory performance achieved by subjects with complete tissue-borne dentures in relation to those with natural dentition was of 40%¹⁵, 16%¹⁶ and 33.3¹⁷.

Given these data, it can be suggested there is a deficiency in functional effectiveness of the prosthesis compared to natural teeth. Tooth loss

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and changes in oral cavity status may affect chewing process in senior citizens. Most commonly unilateral chewing movements are perceived to have such consequences as poor denture retention and chewing inefficient caused by muscular flaccidity¹⁸.

Considering the importance of this issue for adult and the elderly adult health and quality of life, this study aims to compile and analyze data from scientific papers on the relationship between chewing and removable dentures in adults and elderly adults in order to contribute to the prevention or intervention projects associated to this special population.

■ METHODS

A systematic review of scientific literature on the relationship between mastication and removable dental prosthesis was performed and the initial search of descriptors was based on the question if there is a relationship between alterations in the chewing process is present in the use of removable dentures in adults and older adults.

The search was conducted with the key words aging, chewing, dental prostheses and speech, in Portuguese, English and Spanish, and were cross-linked for this purpose. An integrative search of SCIELO, PUBMED and LILACS databases was conducted during March to July 2014, covering a period from January 2006 to July 2014 for articles in Portuguese, English and Spanish.

Criteria for considering studies for this review

The revised studies included original qualitative and/or quantitative research articles with the purpose of identifying the relationship between the use of removable dentures and chewing in adult and elderly subjects users of removable dental prosthesis. Articles excluded were those related exclusively to the performance of mastication on implanted dental prosthesis users, surface electromyography studies about mastication muscles assessment and those which compared masticatory performance between removable and implantable dental prosthesis.

■ LITERATURE REVIEW

The search began considering key words and articles abstracts and the results indicated 21 abstracts for potential inclusion. After applying the inclusion and exclusion criteria, 11 articles were selected for full review.

The country of origin verification indicated that 55% of the articles were from Brazil, 9% from Japan, 9% from Bosnia, 9% from France, 9% from India and 9% from Thailand.

The eleven studies analyzed presented some degree of heterogeneity in relation to its objectives and methodologies so they were organized according to subject area.

Author/ year/ journal	Simple	Study objective	Method and procedures for evaluating chewing on dentures users	Results
Matiello et al., 2005. Salusvita, Bauru ¹⁹ .	n = 20 G1: 10 edentulous subjects G2: 10 natural teeth subjects Age from 41 to 64, both genders.	To compare masticatory skills in edentulous and normal teeth subjects.	To evaluate the masticatory efficiency (ME) patients chewed sieved almonds in 10, 20 and 40 seconds. The masticatory performance (MP) was verified by using a simulator where the patient made 40 chewing cycles using the same set of sieves. The masticatory capacity (MC) and level of satisfaction (LS) was assessed through a questionnaire, based on data provided by the patients and the level of satisfaction.	Normal teeth subjects presented 92,5% in ME, 97,5% in MP, 100% in MC and 99,5 % in NS, while edentulous subjects presented 25% in ME, 17,5% in MP, 57,86% in MC and 67% in LS.
Andrade et al., 2006. International Journal of Dentistry, Recife ²⁰ .	n = 50 Total bimaxilar prosthesis users, both genders, mean age of 59,6 years .	To evaluate masticatory efficiency of complete denture users with a self-perception questionnaire on eating habits.	The investigation was conducted through a self-perception questionnaire with questions about the prostheses usage time, chewing difficulty, food avoidance and consistency and which factors caused chewing difficulties.	86% of total subjects declared chewing difficulties and 27,9% food avoidance.
Cavalcanti et al., 2008. Revista CEFAC.	n = 53 42 to 76 years old subjects, both gender, divided in two groups: G1 (n=32 with total or partial removable prosthesis), and G2 (n=21 with natural dentition).	To verify masticatory characteristics in total or partial removable prosthesis users.	The evaluation was conducted with crackers in habitual chewing and analyzed by an orofacial myofunctional evaluation protocol and a data collection protocol developed for this study. The observed topics were structures and musculature characteristics, type of cut, maintenance of labial seal, chewing time, number of chewing cycles, and type of mastication (unilateral or bilateral). The subjects were audio video recorded.	It was verified altered characteristics for masseter muscle function and the type of cut for G1, with significant differences when compared to G2. There was no significant difference between the groups regarding jaw movements, type, time and number of chewing cycles.
Fueki et al., 2011. Journal of Oral Rehabilitation ²¹ .	n = 131 Removable partial prosthesis users with mean age of 67 years.	To investigate the relationship between objective masticatory function with respect to masticatory performance and ability to mix the food; patient's perception of own ability to chew; oral health-related to quality of life.	The mixing capacity was evaluated with a bucket of two colors, masticatory with peanuts and the patient's perception of own ability to chew was rated by using a questionnaire of food intake. The quality of life related to oral health was measured by the Oral Health Impact Profile – Japanese version (OHIPJ).	Results demonstrate an ability to chew perception significant mean effect (OHIPJ). The effect of mixing capacity of food on the perceived chewing ability was not statistically significant.
De Lucena et al., 2011. Journal of Oral Rehabilitation ²² .	n= 28 Total prosthesis users (superior and inferior): 23 females and 5 males; age from 52 to 88 years.	To evaluate the correlation between patient subjective evaluation and dentist functional assessment, and the correlation of these variables with masticatory function objective measures.	Patients rated level of satisfaction with their dentures through a 0-100 visual analog scale. The prostheses were evaluated by a dentist using a scale of 0-9, taking into account functional aspects. Threshold chewing and swallowing testing performance was performed with artificial test food (Optocal), and the average particle size was determined by sieving method.	Data from both masticatory tests showed no significant correlation with patient satisfaction or the dentist prosthesis assessment. These variables indicated no significant relationship with masticatory efficiency.

Author/ year/ journal	Simple	Study objective	Method and procedures for evaluating chewing on dentures users	Results
Kamber-Cesiret al., 2011. Pesq Bras Odonto ped Clin Integr, Joao Pessoa ²³ .	n = 75 Removable prosthesis users with age from 28 y 86 years, divided in 3 groups: G1 < 39 years, G2 between 40 – 59 years and G3 > 60 years	To assess satisfaction among patients with partial removable dentures in relation to retention, aesthetics, speech, mastication and prosthesis comfort.	The questionnaire devised for this study was divided into two parts: the first one, referred questions on the previous experience of wearing dentures, age, sex, marital status, education level, chronic diseases and smoking; the second part qualified aspects as retention, aesthetics, chewing, speech and prosthesis comfort, using a scale from 1 to 5 (1= dissatisfied and 5 = excellent).	The higher mean value was related to speech and superior removable prosthesis (4,73), and the lowest to mastication and superior and inferior prosthesis (3,97).
Bajoria et al., 2012. The gerontology Society and John Wiley & Sons ²³ .	n= 30 Conventional total prosthesis users (superior and inferior), mean age of 65 years.	To assess the level of satisfaction of edentulous subjects related to masticatory function and aesthetics versus conventional dentures.	The level of satisfaction and ability to chew were evaluated through questionnaires: (I) before treatment and (II) after insertion of new dentures in 30-45 day follow-up. The questionnaires were applied to verify the perception of patient satisfaction and masticatory capacity with proposed treatment.	Rehabilitation with conventional full denture was an improvement in satisfaction and chewing ability levels.
Bessadet et al., 2013. Journal Appl Oral Science ²⁴ .	n= 19 Removable partial prosthesis users, 13 females with mean age of 61 years and 6 males with mean age of 51 years.	To estimate the partial removable prosthesis impact related to masticatory markers.	Subjects chewed carrots and peanut samples with and without their prosthesis. The particle size expectorated was characterized by average particle size (D50), determined by the natural point of swallowing. Number of chewing cycles (CC), chewing time (CT) and masticatory frequency (MF = CC / CT) were videotaped.	D50 mean values of carrots and peanuts were lower regardless of the Kennedy Class. CC, CT and CF recorded values decreased for each type of food. With or without PDPR, granulometry values were above the regulatory masticatory index (MNI) determined as 4.000 microns.
Viwatwongkas et al. 2013. J Med Assoc Thai ²⁴ .	n = 2.676 Adultos de 60 años y más, todos usuarios de prótesis dental completa.	To investigate the usage of total prosthesis related to mastication and to determine the strength of the association between no chewing and other potential risk factors.	Sample consisted of Thai male adults who received a total prosthesis (CEDIP project, 2008).	12.5% of aged subjects did not use the complete prosthesis to chew food. Important risk factors that influenced the prosthesis nonuse to chew food were level of satisfaction with the dental prosthesis and its maintenance.
Franciozi et al. 2013. Salusvita, Bauru ²⁵ .	n = 20 4 males and 16 females, total prosthesis user with mean age of 67,1years..	To analyze masticatory function in different types of total prosthesis.	Masticatory performance tests were carried out with artificial test food using a sieve method.	It was observed a similarity between the three prostheses types used in the study, however on the comparison between groups and use of denture versus bilateral balanced occlusion, the study showed better results for 1 and 5 sieves.
Gonçalves et al., 2014. Journal of Oral Rehabilitation ²⁶ .	n = 29 14 partially edentulous subjects, mean age of 61 years and 15 edentulous subjects with mean age of 66 years.	To evaluate mandibular movements during mastication in complete and partial removable dentures users.	Subjects were assessed kinesigraphically during peanut and artificial food mastication in randomized sequences.	The removable dental prosthesis (PDR) group presented short phases of opening, closing and chewing cycles. Maximum speeds were also higher in PDR group that exhibit a faster chewing sequence with vertical and lateral jaw movements when compared to complete denture group.

Figure 1 – Reviewed articles according to author, sample, study objective, method and procedures for evaluating chewing on dentures users and results

After content analysis it was not possible to compare the differences between sexes, because gender was not a variable considered in most study variables except for one¹⁹, which stated when considering partial denture users, male subjects generally showed less satisfaction with their chewing than female subjects though this result was not statistically significant. On the topic satisfaction, two articles^{20,21}, which applied questionnaires to edentulous subjects, verified that the use of the prosthesis improved the level of satisfaction when related to good levels of stability and comfort of the prosthesis. However, it was reported that 32.1% of users were satisfied with their prostheses and 39.3% were unsatisfied²¹. When researching topics that associated variables as retention, aesthetics, speech, mastication and comfort, chewing was the lowest valued by partial dentures users¹⁹. An investigación²² comparing chewing level of satisfaction, amid subjects with natural teeth and edentulous denture users, attested levels of satisfaction of 99.5% and 67% respectively.

From a standpoint of preference and/or avoidance of certain foods, studies revealed interesting facts: 86% of respondents reported chewing difficulty and 27.9% reported certain foods avoidance in their diets, choosing the easiest aliment to process and masticate²³; in a Thai investigation with complete denture users, 12.5% of adults did not chew food using their dental prosthesis²⁴.

Regarding the thematic area of masticatory parameters in denture users the data pointed to difficulties in food cutting along with weak masticatory muscles functioning that led to restraint or preference for determined foods. In a research²⁵ with a sample of Kennedy class I and III and dental prosthesis users, the results estimated a decrease in time, number of masticatory cycles and frequency when subjects used their prosthesis compared to when they did not, independently of the Kennedy class. In another article¹⁰ users of partial and complete dentures had increased time and number of chewing cycles when compared to subjects with natural dentition, still a non-statistically significant data, and greater difficulties in cutting food, in a ratio of 71.9% for patients with prostheses and 9.5% for subjects with natural dentition. According to these authors, this may be due to masticatory muscles weakness (also evaluated in the study), which revealed evident alterations in the masseter muscle, significant correlation between cheeks and time prosthesis use, indicating that subjects with shorter time of upper prosthesis use had a higher number of cheeks alterations and a positive correlation between prosthesis use versus number of cycles and between time versus number of chewing

cycles (the latter for dentures users and subjects with natural dentition).

In a masticatory movement's evaluation with a kinesiographic device²⁶, employing natural food (peanuts) and artificial food (Optacal) as test materials, in removable dentures and complete dentures users, it resulted that regardless of the test material, the group of removable dentures experienced faster chewing cycles with opening, closing and duration of total cycles reduced when compared to the other. Correlating masticatory efficiency with almonds and a system of sieves, in dentate subject with denture and with natural teeth it was verified a 67.5% less of masticatory efficiency in the first ones²².

Authors²⁰ confirm low masticatory performance between users of complete denture, when using as stimulus an average size particle of (\pm) 1.0 mm. This research corroborates the results found in dentate subjects and users of dental prosthesis which found out that prosthetic masticatory performance was 80% lower than those with natural dentition²². A study²⁷ concluded that the type of prosthesis had influence on masticatory performance and greater efficiency was related to balanced bilateral occlusion when the focal point was on masticatory efficiency and type of full denture.

In a structural equation model study²⁸, the findings pointed to masticatory performance being a critical factor for the masticatory ability perception of prosthesis user and that it had a negative impact when related to quality of life and oral health among those subjects.

Due to the characteristics of chewing and the difficulty that most of these subjects face, it is suggested a follow up program that may include chewing process intervention by a speech and language pathologist since this professional can facilitate the adaptation process, aiming to ensure maximum efficiency and effective prosthesis usage by correlating different functions (phonoarticulatory, chewing and swallowing).

Thus, there is a need to inform about the relevance of the stomatognathic system, highlighting chewing system, as this allows the formulation of novel speech and language pathology practices which may provide solutions for current prosthesis users demands and encourage the creation of innovative public policies in the area of oral health.

■ CONCLUSION

Systematic review studies indicate that satisfaction, performance, efficiency and masticatory parameters are crucial variables related to users of removable dental prosthesis.

RESUMEN

Tras el paso de los años, la pérdida de dientes genera la necesidad de recurrir al uso de prótesis dental. Específicamente, las alteraciones en el proceso de masticación en usuarios de prótesis dental removible se consideran un problema no sólo en relación a las modificaciones a nivel morfofuncional, sino que también en la propia satisfacción en cuanto a la masticación y funcionalidad de este proceso. El propósito de esta revisión es compilar y analizar los artículos científicos sobre la relación de la masticación y prótesis dental removible en adultos y adultos mayores. Se realizó una búsqueda integrativa de artículos en las bases de datos SCIELO, LILACS y PUBMED, seleccionando artículos publicados entre el año 2005 a 2014. Los artículos de revisión incluyeron estudios que identificaran la relación entre el uso de prótesis dental removible y la masticación en adultos usuarios de dicha prótesis dental. En la búsqueda se encontraron 21 documentos para potencial revisión. Finalmente, aplicando criterios de inclusión y exclusión se seleccionaron 11 artículos, los cuales tomaban diferentes variables de estudio, entre ellas, nivel de satisfacción, rendimiento, eficiencia y parámetros masticatorios. La satisfacción, el rendimiento, la eficiencia y los parámetros masticatorios fueron las variables que se encontraban afectadas en usuarios de prótesis dental removible.

PALABRAS CLAVES: Envejecimiento; Prótesis Dental; Masticación; Fonoaudiología

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