

INFLUENCE OF THE WEAR TIME OF COMPLETE DENTURE ON SWALLOWING, CHEWING, AND MYOFUNCTIONAL POSTURAL CONDITIONS

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Abstract: Purpose. Complete denture is a therapeutic modality widely used by edentulous patients. However, with the years, its wear may have harming effects regarding the phono-articulatory organs and the swallowing/chewing functions. In this investigation, the relationship between the time of denture use and the swallowing and chewing difficulties was assessed, as well as these people's orofacial myofunctional postural conditions. **Material and Methods.** Individuals of both sexes, completely edentulous, wearing conventional maxillary and mandibular conventional complete denture acrylic resin were recruited from August 2018 to February 2020, from School of Dentistry of Ribeirão Preto of the University of São Paulo (USP) and distributed into three groups according to the time of denture use: G1 – 1 to 6 months (n=8); G2 – 7 to 18 months (n=12); G3 – 18 to 120 months (n=9). Then, they were interviewed and assessed with the Orofacial Myofunctional Evaluation (OMES). Pearson correlation test ($\alpha=.05$) was used to correlated the time of denture with the findings in the interview and protocol. **Results.** A total of 29 individuals were assessed, being 14 women and 15 men with aged 43 to 83 years (mean 63 years). One (3.4%) participant had complaints related to swallowing dry foods, while 3 (10.3%) had complaints related to swallowing hard foods. However, there was no correlation with the time of denture wear. Concerning the orofacial myofunctional postural aspects and conditions, no significant differences were observed for the phono-articulatory organs: lips, tongue, and cheeks, as well as for the stomatognathic functions of swallowing and chewing related to the time of denture wear. **Conclusion.** The time of denture wear did not influence the complaints, neither did it interfere with the postural aspects and conditions of the phono-articulatory organs, or the patients' swallowing and chewing.

Keywords: Prosthodontic, Deglutition, Mastication. Deglutition disorders.

INTRODUCTION

Various structures participate in the swallowing/chewing process, with special attention to the bones (mandible, maxilla, hard palate, hyoid bone, cervical vertebra and skull (styloid and mastoid processes) and cartilages (thyroid, cricoid, arytenoid, and epiglottis). They help to chew as well as to support and stabilize the muscles involved in this function. The teeth help to prepare the food bolus when chewing. The oral, nasopharynx, oropharynx, and hypopharynx cavities correspond to a reference point when describing the swallowing process. The salivary glands (parotid, sublingual, and submandibular) are responsible for producing 95% of the saliva that aids to form and transport the bolus. Besides these structures, more than 30 pairs of muscles and six pairs of cranial nerves seal the complex set of components involved in swallowing.¹

However, these structures suffer changes characteristic of the aging process, which can increase the risk for changes in the swallowing dynamics.²⁻⁴ The physiological changes inherent to aging can influence the swallowing mechanism and causing discomfort in some people, while others may become unable to comfortably swallow any solid.⁵

Some authors have observed that changes in the oral and pharyngeal phases of swallowing occur frequently in people over 60 years old when compared with young people. This is due to affections in the stomatognathic system,⁶ such as atrophy of the lip muscles, hypertrophic change in the tongue, changes in the oral mucosa, decrease in the flow of saliva,⁷ besides motor incoordination, exemplified by the reduced speed of the movements.^{5,8,9} Concomitantly to these, as years go by, these people may also suffer tooth loss, a situation

that directly influences the swallowing capacity since, specifically in the oral phase when chewing, the teeth are responsible for grinding the food, facilitating swallowing, and in addition to being responsible for defining maxillary relationships, which are important in speech articulation and mandibular movements.¹⁰

In order to solve the consequences of total tooth loss, rehabilitating people with complete dentures aims to help recompose the person's stomatognathic system and psychic and social well-being.¹¹ The complete dentures is a widely used therapeutic modality. However, as it is supported by the mucosa, there may be increased resorption of the remaining bone with time, as well as difficulties in the adaptation process.¹² These cause important negative impacts on these people's quality of life when using dentures for an extended time.^{13,14} A retrospective bibliographic review study suggests the need for qualified research to investigate the chewing capacity and the quality of life of long-term denture wearers, given that the studies identified by them did not investigate the time of denture wear or its influence.¹⁵

Thus, aiming to better understand the effects of the time wearing complete removable dentures on the swallowing/chewing process, the objective of this study was to investigate the possible relationship between the time of denture wear and swallowing and chewing difficulties, as well as these people's myofunctional orofacial postural conditions.

MATERIAL AND METHODS

Individuals of both sexes, completely edentulous, wearing conventional maxillary and mandibular conventional complete denture in acrylic resin at 10 years at the most, in satisfactory wearing conditions were recruited from August 2018 to February 2020, from School of Dentistry of Ribeirão Preto

of the University of São Paulo (USP). People with inflammatory lesions, changes in the mucosa or ridge, serious systemic diseases, or cognitive incapacity were not included. The study was approved by the Human Research Ethics Committee of FORP (CAAE certificate: 93712418.1.0000.5419), and the subjects were included after signing the informed consent form.

All the participants were interviewed at first to obtain sociodemographic data, such as age, schooling level, occupation, medical and dental history, and time of denture wear. For the analysis of the relationship between time of denture wear and the response variables, the participants were divided into three groups, according to the time of denture wear – G1: from 1 to 6 months (median: 5 months, n=8); G2: from 7 to 18 months (median: 12.5 months, n=12); G3: from 18 to 120 months (median: 42 months, n=9).

RESPONSE VARIABLES AND ANALYSIS METHODS

The following response variables were considered:

A) Qualitative analysis of the swallowing-related complaints.

For this qualitative analysis, the participants were encouraged to talk about their swallowing experiences with dentures. To systematize the answers, the patients were expected to report their experiences swallowing dry foods and hard foods, as well as episodes of coughing or choking while swallowing or after it, the sensation of food stuck in the throat, the need to swallow the food more than once to clear the oral cavity and the types of food that caused these situations.¹⁶

B) Aspect and postural condition of the lips, mandible, cheeks, face, and hard palate.

Following the orofacial myofunctional evaluation with scores (OMES), the volunteers were asked to stand in their habitual manner

in front of the researcher to assess and classify their postural conditions, as follows:

a) lips– sealed: they fulfill their function normally; sealed with tension: they fulfill their function, but with excessively contracted lips and mentalis muscle; ajar: mild dysfunction; fully open: intense dysfunction.

b) mandible–normal postural condition: it keeps functional space free; occluding teeth or touching ridges: tightening; slightly lowered: mild dysfunction; lowered: intense dysfunction.

c) cheeks– normal; asymmetric: mild or intense; flaccid/arched: intense.

d) facial symmetry– symmetry between the right and left sides: normal; asymmetric: mild or intense.

e) tongue– contained within the oral cavity: normal; interposed there between the dental arches: adaptation/dysfunction or excessively protracted.

f) hard palate – normal; narrowed: mild or intense.¹⁶

C) Respiratory function, swallowing, and chewing.

To assess the respiratory function, the participant was asked whether they were usually nasal- or oronasal-breathers. In case they confirmed the oronasal habit, they were asked whether it took place constantly or only when sleeping. Then, the participant was assessed regarding the postural aspects and conditions that represent an oral breathing pattern – for example, ajar lips, long face, dark circles, and projected mentolabial sulcus.

Swallowing was assessed by observing the lips, tongue, and head behavior while swallowing liquid (water) at will. The lips were observed regarding the capacity to effortlessly seal the oral cavity; seal the oral cavity, although contracting more than normal; seal the oral cavity while swallowing. The tongue was observed whether it stayed within the oral cavity or was interposed there between

the dental arches while swallowing. The head was observed concerning the movement and tension of the facial muscles. It was also observed whether food escaped out of the oral cavity, as well as multiple swallowing for the food bolus they were intaking.

Chewing was assessed observing the ingestion of solid food – a Bono Nestlé chocolate sandwich cookie – standardized by the protocol in question. The participants were instructed to help themselves and eat it as they normally would. It was then verified whether their chewing was predominantly bilateral (either alternated or simultaneous), preferentially on the right or left side, or chronic (i.e., chewing on a single side). It was also verified whether the chewing was frontal or anterior (i.e., chewing mostly with the incisors). Moreover, it was verified whether either the head or other parts of the body moved while they were chewing, as well as changed posture and/or food escape out of the oral cavity.¹⁶ The analyses were conducted only once.

The data obtained were analyzed to characterize the sample. With the Pearson correlation test ($\alpha=.05$), the time of denture wear was correlated with the findings in the interview and protocol. Statistical analyses were performed by using a statistical analysis software program (IBM SPSS Statistics, v21; IBM Corp).

RESULTS

A total of 29 individuals were assessed, being 14 women (48.3%) and 15 men (51.7%) with aged 43 to 83 years (mean 63 years). The sociodemographic data, such as age, schooling level, occupation, medical and dental history, and time of denture wear are presented in Table 1.

It was observed that 25 (86.2%) participants had no swallowing-related complaints, one (3.4%) had complaints about swallowing dry

foods, and three (10.3%) had complaints about swallowing hard foods. Of the four (13.7%) participants that reported a swallowing-related complaint, none was from G1, two were from G2 (one with dry and the other with hard food), and two were from G3 (both reported problems with hard foods). None of them reported other types of complaints – such as coughing or choking while swallowing or after it, a sensation of food stuck on the throat, or need to swallow the food more than once to clear the oral cavity. There was no correlation between the time of denture wear and the swallowing-related complaints ($p=0.436$).

The assessment of posture/position aspects and conditions of the lips and mandible, and cheek, facial symmetry, and tongue position changes were not influenced by the time of denture wear ($p>0.125$). There was a difference in the aspect of the hard palate between G1 (five had mild changes, and three were normal) and G3 (nine normal) ($p=0.020$, Table 2).

There was no relationship of the aspects of the stomatognathic functions, breathing, swallowing/aspects of the lips, swallowing/aspects of the tongue, and chewing with the time of denture wear (Table 3).

DISCUSSION

There was a great difference in the age of the participants of this investigation, ranging from 43 to 83 years, with a mean age of 63 years. This result conflicts with studies published in the literature, which demonstrate a mean age for complete denture wearers above 60 years – i.e., a predominantly old public.¹⁷⁻²¹

This study aimed to assess the influence of the time wearing conventional complete dentures on the performance of functions and the posture of the oral structures involved in the chewing/swallowing process. Moreover, aging is itself a factor that influences this

			Frequency
Sex	Females	Mean age = 62.7 Min. = 43 / Max. = 77	14 (48.3%)
	Males	Mean age = 66.9 Min. = 44 / Max. = 83	15 (51.7%)
Occupation	Retired		17 (58.6%)
	Housewife		3 (10.3%)
	Housekeeper		3 (10.3%)
	Construction		4 (13.8%)
	Janitor		1 (3.4%)
	Leave of absence		1 (3.4%)
Schooling level	Unfinished middle school		23 (79.3%)
	Unfinished high school		2 (6.9%)
	Finished high school		4 (13.8%)

Table 1 – Sociodemographic data and characterization of the sample of the study.

		G1	G2	G3	Total	p
Postural change in the lips	Mild	0 (0.0%)	1 (8.3%)	0 (0.0%)	1 (3.4%)	0.480
	Normal	8 (100%)	11 (91.7%)	9 (100%)	28 (96.6%)	
Postural change in the mandible	Mild	1 (12.5%)	0 (0.0%)	1 (11.1%)	2 (6.9%)	0.466
	Normal	7 (87.5%)	12(100%)	8 (88.9%)	27 (93.1%)	
Change in the cheeks	Intense	0 (0.0%)	1 (8.3%)	0 (0.0%)	1 (3.4%)	0.546
	Mild	8 (100%)	9 (75.0%)	8 (88.9%)	25 (86.2%)	
	Normal	0 (0.0%)	2(16.7%)	1 (11.1%)	3 (10.3%)	
Change in facial symmetry	Mild	8 (100%)	8 (66.7%)	8 (88.9%)	24 (82.7%)	0.130
	Normal	0 (0.0%)	4(33.3%)	1 (11.1%)	5 (17.2%)	
Change in tongue position	Mild	0 (0.0%)	2 (16.7%)	0 (0.0%)	2 (6.9%)	0.218
	Normal	8 (100%)	10(83.3%)	9 (100%)	27 (93.1%)	
Change in the hard palate	Mild	5 (62.5%)	4 (33.3%)	0 (0.0%)	9 (31.0%)	0.020
	Normal	3 (37.5%)	8(66.7%)	9 (100%)	20 (69.0%)	

Table 2 – Compared time of denture wear in relation to the participants' postural changes.
Pearson chi-squared test

		G1	G2	G3	Total	<i>p</i>
Breathing	Oronasal/Mild	4 (50.0%)	5 (41.7%)	1 (11.1%)	10 (34.5%)	0.192
	Nasal/Normal	4 (51.1%)	7(58.3%)	8 (88.9%)	19 (65.5%)	
Swallowing/ aspect of the lips	Mild	2 (25.0%)	5 (41.7%)	1 (11.1%)	8 (27.6%)	0.295
	Seemingly effortless	6 (75.0%)	7(58.3%)	8 (88.9%)	21 (72.4%)	
Swallowing/ aspect of the tongue	Adaptation or dysfunction	3 (37.5%)	5 (41.7%)	2 (22.2%)	10 (34.5%)	0.636
	Normal	5 (62.5%)	7(58.3%)	7 (77.8%)	19 (65.5%)	
Chewing	Alternated bilateral	0 (0.0%)	1 (8.3%)	4 (44.4%)	5 (17.2%)	0.636
	Simultaneous bilateral	3 (37.5%)	6 (50.0%)	1 (11.1%)	10 (34.5%)	
	Preferential unilateral	4 (50.0%)	5 (41.7%)	3 (33.3%)	12 (41.4%)	
	Chronic unilateral	0 (0.0%)	0 (0.0%)	1 (11.1%)	1 (3.4%)	
	Anterior (frontal)	1 (12.5%)	0 (0.0%)	0 (0.0%)	1 (3.4%)	
	Does not perform the function	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	

Table 3 – Comparison of the time of denture wear with the stomatognathic functions.
Pearson chi-squared test

process; if it is combined with wearing conventional complete dentures (which are supported on the mucosa), there can be further impairment.²⁻¹⁰ The results demonstrated that complaints related to swallowing, chewing, and postural changes were detected in the patients. However, the time of wear did not have a significant influence on the performance of the functions and posture of the structures assessed.

Only four (13.8%) participants had swallowing-related complaints. These referred only to swallowing hard and dry foods, with no relationship with the time of denture wear. People that wear dentures tend to choose easy-to-chew foods, regardless of their nutritional value,¹⁹ and the complete denture interferes with the time taken to swallow.²² The type of food was not observed to have any great influence on swallowing since 86.2% of the participants had neither complaints associated with this function nor incapacity to intake the foods offered. This suggests that, with time, a muscular and mechanic adaptation of the stomatognathic system can take place

regarding the swallowing reflex. Hence, such changes go unnoticed by the patients.

Authors reported the association of the lip and tongue motor functions with the ability that complete denture wearers have to mix the food in the oral cavity. They also observed that the tongue motor function positively influenced these denture wearers' capacity to mix the food bolus.²⁰ The results indicated that 34.5% of the participants interposed the tongue between the dental arches, and 65.5% had normal tongue behavior when swallowing. Moreover, the time of denture wear did not influence this condition – which suggests that the person's capacity to adapt the tongue surpasses the damage of the denture worn for a longer time. Few individuals had visible changes concerning the posture and position of the lips, mandible, and cheeks, and facial symmetry. Moreover, these parameters were not influenced by the time of wear.

The time of denture wear influenced the shape of the palate. In the group with the longest time of wear, the palate was normal when compared with the group that had worn

it for less time. This result may be due to ridge bone resorption occurred with time, giving the impression of a less narrowed palate at the moment they were examined.

Regarding the participants' chewing, five (17.2%) had the alternated bilateral type; 10 (34.5%) had simultaneous bilateral; 11 (37.9%) had preferential unilateral; and one (3.4%) had chronic unilateral chewing. Despite finding several chewing types in the patients, and the questioning of various authors in the literature regarding the chewing quality of patients that wear complete dentures, no correlation was observed between the chewing type and the time of denture wear. There was possibly no correlation with the chewing quality, either, since these wearers had no significant chewing complaints. The literature suggests that the patient's satisfaction with the dentures decreases with time. Others suggest that muscle training and adaptation can favor wearing dentures – a statement that agrees with the results.¹⁷

Therefore, no negative influence of the time of denture wear on the swallowing and chewing functions and postural position of the phono-articulatory organs was identified. A study indicated that a favorable oral condition and the denture quality are important to the comfort, performance of functions, and quality of life of complete denture wearers.¹⁸ These authors' results suggest that the time of wear is not as important as the quality of the dentures, with which this study agrees since the patients assessed in it wore well-fitted dentures and had no changes in the mucosa nor any other comorbidities.

The time of wear was expected to influence negatively the aspects assessed, considering the underlying maladjustments that resulted from the continuous bone resorption and dental wearing, with occlusal changes. Nevertheless, in a systematic review conducted to assess

the effect of the complete denture occlusion on the patient's function and quality of life, it was demonstrated that the currently available evidence does not allow for the conclusion that any occlusal scheme furnishes an improved function or quality of life. Hence, high-quality clinical research is necessary to investigate the chewing capacity/quality, as well as the quality of life of long-term complete denture wearers.¹⁵ Furthermore, the authors suggest that many aspects of the development of complete dentures seem to lack evidence from controlled clinical studies to sustain what has been pointed out regarding the treatment with complete dentures. Although some aspects of this treatment are well understood, there are still conflicts between the "old truths" of oral rehabilitation and the current findings.

The limitations of this study include the absence of swallowing process analyses with videofluoroscopy,⁶ or noninvasive objective methods,⁸ as well as the chewing efficiency with objective methods,²¹ and the assessment of food consumption and nutrient intake with a validated feeding frequency questionnaire.¹⁹ Another limitation may lie in the division into groups, which considered the time of denture wear, instead of the participants' age. Thus, future studies with a larger sample, groups divided by both age and time of wear, and objective methodologies, are still necessary.

CONCLUSION

The time of denture wear did not influence the swallowing difficulties; neither did they interfere with postural aspects and conditions of the phono-articulatory organs in swallowing and chewing.

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