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Original Article

Influence of quality of total prostheses on the prevalence of temporomandibular disorder

Influência da qualidade das próteses totais na prevalência de disfunção temporomandibular

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Resumo

Introdução: A disfunção temporomandibular (DTM) é uma desordem que envolve os músculos da mastigação e da articulação temporomandibular. Pacientes desdentados totais e que utilizam protéses requerem uma avaliação criteriosa, já que o edentulismo leva a prejuízos que podem contribuir para o aparecimento de DTM. **Objetivo:** O objetivo deste presente estudo foi avaliar o efeito da qualidade técnica das próteses totais (PTs) na incidência de DTM em pacientes portadores de PTs bi-maxilares. **Material e método:** Foi aplicado um questionário a 154 pacientes contendo os dados pessoais, o histórico das próteses, o índice anamnésico para DTM e o índice de qualidade de prótese. **Resultado:** Dos 154 pacientes examinados, 64 (41,6%) estavam livres de DTM, 61 (39,6%) possuíam DTM leve, 23 (14,9%), moderada e apenas 6 (3,9%) mostravam DTM severa. Quanto à qualidade da prótese total, 78 (50,6%) desdentados totais portavam PTs satisfatórias e 76 (49,4) estavam com próteses insatisfatórias. Quanto ao tempo de uso da prótese total, cerca de 50% dos indivíduos com até 10 anos de uso apresentaram algum grau de DTM e 70% dos indivíduos com mais de 10 anos acusaram a presença de DTM. **Conclusão:** Considerando-se a metodologia empregada e a população estudada, pôde-se concluir que a qualidade das PTs não influenciou na presença de DTM.

Descritores: Prótese total; boca edentada; síndrome da articulação temporomandibular.

Abstract

Introduction: Temporomandibular disorder (TMD) involves the mastication and temporomandibular articulation muscles. Completely toothless patients with prostheses should be thoroughly assessed since edentulism causes damage that can lead to TMD onset. **Objective:** This study aims to assess the effect of the technical quality of total prostheses (TPs) on TMD occurrence in patients with bimaxillary TPs. **Material and method:** 154 patients responded to a questionnaire to obtain personal data, information regarding prostheses, anamnestic index for TMD, and the prosthesis quality index. **Result:** Of the 154 patients examined, 64 (41.6%) had no TMD, 61 (39.6%) had mild TMD, 23 (14.9%) moderate, and only 6 (3.9%) showed severe TMD. As for the quality of total prosthesis, 78 (50.6%) completely toothless individuals had satisfactory TPs while 76 (49.4) presented unsatisfactory prostheses. Regarding the time using total prosthesis, around 50% of individuals with up to 10 years use presented some degree of TMD and 70% of individuals with over 10 years presented TMD. **Conclusion:** Considering the methodology used and the population studied, we conclude that the quality of the TPs did not influence the incidence of TMD.

Descriptors: Total prosthesis; edentulous mouth; temporomandibular articulation disorder.

INTRODUCTION

Temporomandibular disorder (TMD) is a musculoskeletal disorder that involves the mastication muscles, temporomandibular articulations (TMAs), and adjacent structures[1,2].

The main signs and symptoms are pain in the muscles for mastication and/or TMA, sounds during condylar movement, and limitation or lack of coordinated jaw movement[3,4]. This pain triad appears together with mandibular disorder and articulatory sounds, as well as other clinical factors, including muscle and articulatory pain, palpation and during function, otalgia, tension headache, bruxism, trismus, limited mouth opening, pain in the cervical region, and static and dynamic abnormalities of the occlusal relationship[4,5].

TMD has received attention from researchers over the years and is still the object of several epidemiological studies, helping to explain the physiopathological process of the disease, often allowing us to anticipate the diagnosis of TMD in a given population[6].

Treating completely toothless patients requires a thorough assessment of biological, local, and general factors aimed at a precise indication of the treatment to be adopted. Performing an assessment to detect TMD is very important and must not be disregarded[7]. Tooth loss is a traumatic event and the individual's ability to adapt to total prosthesis (TP) is considerably influenced by their capacity to cope with their edentulous condition. Edentulism may cause functional, esthetic, and nutritional losses that negatively impact the wellbeing and general health of individuals[8]. Even in cases of prostheses in excellent condition, functional limitations still occur, making individuals with total prostheses prone to functional changes in the stomatognathic system[9].

Completely toothless patients present multiple factors that make diagnosis more complex. Natural tooth loss often causes psychological issues in patients[8]. Iatrogenic factors can also be considered by dentists when producing dentures, such as an increase or decrease in the vertical dimension of occlusion, errors in the record of the central relationship, and phonetic problems. Such factors often lead to morphological changes in the stomatognathic system, like muscle hyperactivity and parafunctional habits, contributing to TMD onset[10].

Studies with patients using total bimaxillary prostheses have demonstrated that, when assessed by dentists, a high proportion of TPs is considered unsatisfactory. However, the clinical assessment of total prosthesis quality is too subjective, being greatly influenced by the examiner. The absence of a standardized methodology to examine TPs and how this affects the possibility of comparing and analyzing the results of different studies led Sato et al.[11], 1998, to propose an index to assess the quality of dentures for quantitative and reproducible analysis of TPs. The authors studied the clinical factors of 320 patients with dentures that influenced the quality of the prostheses. Their data allowed them to list the main factors that contributed to the quality of the total prostheses, including the arrangement of the anterior artificial teeth, interocclusal distance, stability, occlusion, articulation, retention, and extension of the edge of the total inferior prosthesis. The authors reported that such factors can be used from a scientific perspective as an assessment protocol for total prostheses.

In 2000, McCord, Grant[12] proposed a guide for the clinical assessment of patients and their dentures. The authors state that the professional is responsible for diagnosing and treating several parameters related to the production of total prostheses, including knowing the anatomical, physical, and psychological conditions of each patient and understanding them holistically. For denture assessment, the authors proposed a questionnaire containing questions regarding the patient's perception, the dental surgeon's perception, retention (adaptation tissue), sealed peripheral, the extension of the edge, the relationship between arches, artificial teeth, appearance, rim, and support areas. All questions were assigned scores that indicate either acceptability or not. According to the authors, this questionnaire can be helpful when incorporated into daily use by patients seeking to replace their dentures.

There is still little information regarding the relevance and effects of TP quality on TMD prevalence. This epidemiological study into TMD incidence in patients with bimaxillary total prostheses aims to gather information to establish clinical parameters that guide the professional towards an adequate diagnosis of temporomandibular disorder in this type of patient.

MATERIAL AND METHOD

We assessed 154 completely toothless patients who had been using conventional joint prostheses for at least one year, regardless of sex or age. The patients were treated at the Total Prothesis Clinic of the School of Dentistry of Araraquara-UNESP and contacted via phone from a list of 1,000 registered individuals, the number used to calculate the sample. We used a random sample due to the proportion with an alpha level of significance of 5%, test power of 90%, constant proportion of acceptance to participate of 10%, and effect size of 19%. The forms do not mention clinical features, which was important to characterize a heterogenous population sample. All participants signed an Informed Consent Form (TCLE)*.

The methodology was carried out by two researchers: one responsible for performing the clinical TMD exam and another for assessing the quality of the prosthesis. Researcher 1 guided the filling in of the questionnaire and the clinical TMD exam, informing the patient regarding the items or terms that were not understood. During the exam, the total prostheses would be kept in the patient's mouth and removed only for the intraoral exams and assessments.

Researcher 1 starts the clinical TMD exam in a clear and helpful manner for the patient, using the form (Table 1).

Table 1. Form of anamneses and clinical exam.

1. Personal data
2. Consent for participation in the research
3. Anamnestic index: degree of TMD. The 10 answers of the anamnestic index received specific values, where *yes* was assigned 10, *sometimes* 5, and *no*, zero. The following questions were presented:
a) Do you have difficulty opening your mouth?
b) Do you have difficulty moving your jaw to the sides?
c) Do you feel fatigue/ muscle pain when chewing?
d) Do you experience headaches?
e) Do you experience back or neck pain or torticollis?
f) Do your ears or near them hurt?
g) Do you ever hear noises coming from your TMA when chewing or opening your mouth?
h) Do you have any habits like clenching or grinding your teeth?
i) Do you feel that your teeth (prosthesis) do not articulate well?
j) Do you consider yourself a nervous person? (On a scale from 0 to 10)
These data allowed ranking the studied patients as follows, according to degree of TMD severity:
→ values from zero to 19 – no TMD.
→ values from 20 to 44 – mild TMD.
→ values from 45 to 69 – moderate TMD.
→ values from 70 to 100 – severe TMD.
4. Record of total prostheses: Time using the current prostheses divided into three groups: from 1 to 5 years, from 5 to 10 years, and more than 10 years of use.
5. Specific physical exam:
a) Degree of maximum vertical opening
b) Parafunctional habits
c) Muscle and articulatory sensitivity to palpation:
We palpated the following muscle sites: Extra-oral (digital pressure of 2 lb or 0.906 kg): masseter origin, masseter body, masseter insertion, anterior temporal, middle temporal, posterior temporal, posterior cervical, sternocleidomastoid; Intraoral (digital pressure of 1 lb or 0.453 Kg): lateral pterygoid. medial pterygoid. specific articulatory sites (digital pressure of 1 lb or 0.453 Kg): pre-auricular palpation and intrameatal palpation; Functional Manipulation of the Jaw: inferior lateral pterygoid.
d) Auscultation of the TMA

*Ribeiro RA. Prevalence of signs and symptoms of craniomandibular disorder in patients with bimaxillary total protheses and natural edentulous patients [thesis]. Araraquara: School of Dentistry, Universidade Estadual Paulista "Júlio de Mesquita Filho"; 2000.

Researcher 2 proceeded with the examination to assess the total prostheses[11] with a form gathering the following information: a) selection of the artificial tooth, b) arrangement of the anterior teeth, c) interocclusal distance (free functional space), d) adaptation of the superior and inferior prostheses, e) stability of the superior and inferior prostheses, f) space for the tongue, g) occlusion, h) articulation, i) retention of the superior and inferior prostheses, j) extension of the edge of the superior denture, k) extension of the edge of the inferior denture, l) wear facets, and m) positioning of the posterior teeth.

Total prostheses quality was ranked into three categories, according to the value of the sum of the scores attributed to them[11]: good (minimum value = 16 and maximum value = 26), regular (minimum value = 27 and maximum value = 37), and bad (minimum value = 38 and maximum value = 48).

For purposes of comparison between the groups and application of the statistical test, in this study, the total prostheses classified as good are considered satisfactory, and those classified as regular or bad are considered unsatisfactory.

The statistical analysis was based on the Chi-square method ($\chi 2$) where the frequencies and percentages observed were presented and the existence of an association between the two variables of prosthesis quality – satisfactory and unsatisfactory - ascertained. The coefficient ϕ was also used to estimate the degree of association, while the Spearman coefficient was applied to provide the degree of association between the anamnestic index and age.

This research was submitted to the Research Ethics Committee of the School of Dentistry of Araraquara and was approved under protocol number 63/03.

RESULT

The sample included 154 individuals, of which 78 (50.6%) classified their prostheses as satisfactory and 76 (49.4%) as unsatisfactory, comprising two groups for analysis. The groups included 111 (72.1%) female and 43 (27.9%) male patients divided into groups according to prosthesis quality. The frequency of individuals with satisfactory prostheses was 61.5% (48) for females and 38.5% (30) for males. The frequency of individuals with unsatisfactory prostheses was 82.9% (63) for females and 17.1% (13) for males.

The groups showed homogeneity for age according to the quality of the prosthesis and sex in the descriptive statistics for the participants' age. There was no evidence of an association between prosthesis quality and TMD given that the percentages of the groups are very close at each TMD level. However, there is evidence that as TMD worsens, the percentage of individuals in each group decreases (Figure 1).

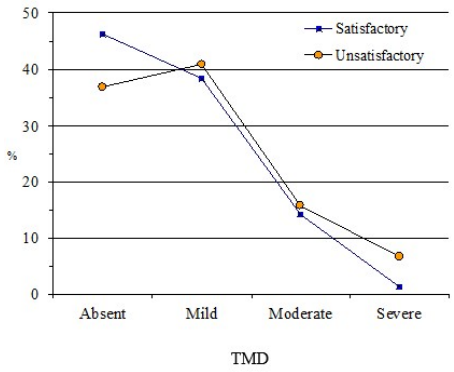

Figure 1. Graphic representation of the percentages of individuals classified according to the degree of TMD and prosthesis quality: satisfactory or unsatisfactory.

Figure 2 presents the anamnestic index concerning the age of individuals, according to the two experimental groups divided by prosthesis quality: satisfactory or unsatisfactory. The four horizontal bands correspond to the degrees of TMD: absent, mild, moderate, and severe. Therefore, there is little association between the anamnestic index and age, either for the group with satisfactory prostheses or for the unsatisfactory prostheses group. As a measure of the association between the anamnestic index and age, we calculated the coefficients of Spearman correlation that were low or equal – 0.198 and – 0.294, respectively, for the group of individuals with satisfactory prostheses and the group with unsatisfactory prostheses. Furthermore, the charts show no significant difference for the degree of TMD between the groups divided by prosthesis quality.

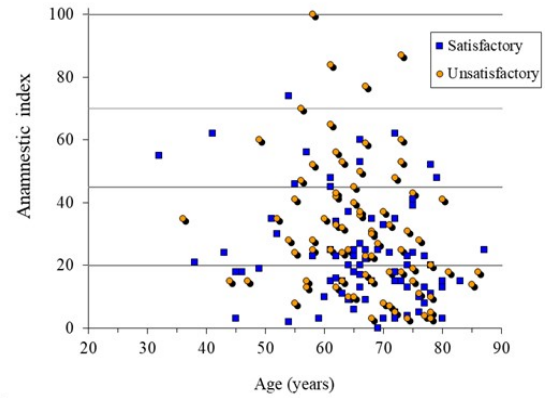

Figure 2. Graphic representation of the anamnestic index for participant age grouped according to quality of prosthesis.

Figure 3 shows the percentages of individuals classified according to the time in years using their current prosthesis and prosthesis quality – satisfactory or unsatisfactory. There is no evidence of an association between the time of use of the prosthesis from 1 to 5 years or from 5 to 10 years with the quality of the prosthesis. However, an association between a time of use longer than 10 years and unsatisfactory prostheses was observed. Among individuals with satisfactory prostheses, 80.7% had been using prostheses for less than 10 years, while only 19.2% had been using prostheses for more than 10 years. On the other hand, of the individuals with the unsatisfactory prosthesis, 38.2% had been using prostheses for less than 10 years and 61.8% for more than 10 years.

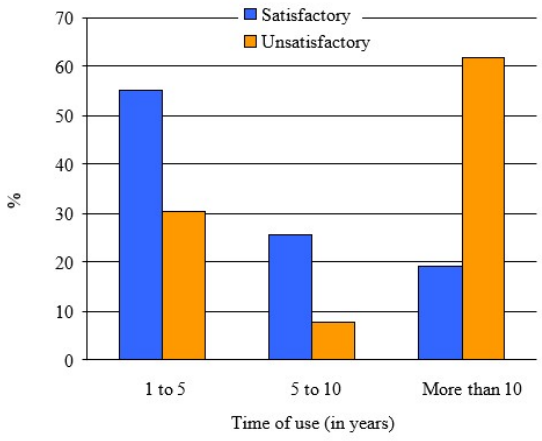

Figure 3. Graphic representation of the percentages of individuals classified according to the time of use of the current prosthesis, in years, and prosthesis quality: satisfactory or unsatisfactory.

An increase in the percentage of cases with the presence of TMD at varying degrees was only observed in individuals who had been using prostheses for more than 10 years. Of the individuals who had been using prostheses for up to 10 years, around 50% presented some degree of TMD, whereas, after 10 years, 70% presented the disorder.

DISCUSSION

After decades of research, some discussions concerning TMD etiology remain. Investigating risk factors and etiological agents remains current and relevant. Prior studies with toothless individuals sought to clarify aspects unrelated to the use of total prosthesis and TMD manifestations influenced by other factors, such as patient age, sex, diet, metabolism, or even their psychological condition[13]. Some authors state that the dental variable (prosthetics) could be masked by other etiological components, like behavioral and emotional factors, stress, and parafunctional habits[3,14,15].

The fact that TMD increases both in frequency and severity with age is supported by the changes generated by the aging process itself, such as degenerative diseases of the TMA, reduced neuromotor perception, changes in muscle tonus, and oral manifestations of systemic diseases, and psychological changes[7].

Regarding age, the descriptive statistics found significant homogeneity in the studied group, which minimizes the potential influence of this factor on the results.

We also found that there were more women among the individuals with unsatisfactory prostheses. It would be a confusing factor for our study if the female sex was a risk factor for TMD. However, although some authors[4,9,16] have found that the number of women seeking treatment for TMD is greater than the number of men, implying that females are more affected by the condition, this has been interpreted as a difference in attitude about oral health that reflects social, psychological, and behavioral discrepancies between the sexes.

According to Rugh, Solberg[17], the indices used in the epidemiological studies overestimate the severity of the problem. For the authors, epidemiological, descriptive, and analytical studies that investigate TMD incidence are valid but provide no definitive answers. These studies have been historically important for clearly demonstrating that the population with TMD is heterogeneous, despite presenting several common etiological factors.

In our study, 58.4% of individuals presented some TMD symptom, with 18.8% being to a moderate or severe degree. This led us to conclude that completely toothless patients are individuals who can present injuries to the stomatognathic system and should be assessed carefully for such a possibility, during the initial exam, to produce new prostheses.

Carlsson[18] reported that occlusal instability is the most important factor for the development of TMD among PT users. Magnussom[19] also highlighted the relevance of patient follow-up since it could prevent or delay TMD symptom onset. Moreover, in patients with poorly adapted dentures and deficient function, new TPs may reduce both the intensity and frequency of headaches and the signs of TMD in the mastication system.

Köhler et al.[14] reported that patients with TPs presented more severe TMD than patients who did not use TPs, thus showing an association between the use of prostheses and signs of TMD.

Our study found no association between the degree of TMD severity and the quality of total prosthesis, similarly to Carlsson's[18] results, where no statistical relationship was found between TMD and changes in the TPs.

We found that 49.4% of assessed individuals considered their TPs unsatisfactory. The total prosthesis replaces the natural teeth and their main functions, restoring the masticatory function, promoting a pleasant appearance, and ensuring proper phonetics. However, the professional

must search for objective factors when assessing the quality of the prosthesis, such as retention, stability, adaptation, vertical dimension, and esthetics, among others.

As for the time using the current prostheses, we found that 66 patients (42.9%) had been using dentures for less than 5 years, 26 patients (16.9%) from 5 to 10 years, and 62 patients (40.3%) for more than 10 years. Based on these results, it is notable that the statistical analysis showed a strong association with time of use, which, above 10 years, makes the prosthesis unsatisfactory. Eighty percent of individuals who considered their prostheses satisfactory had been using them for less than 10 years. On the other hand, 61.8% of those with unsatisfactory prostheses had been using them for more than 10 years. Already in 1964, Yoshizumi[20] reported that the quality of total prostheses tends to diminish over time and that a marked worsening of quality occurs, especially from the fourth year of use. Furthermore, after the eighth year of use, many patients experience mastication problems.

Our results allow us to conclude that there is an increase in the percentage of individuals with TMD, of varying degrees, only after 10 years of use. Up to 10 years, around 50% of individuals presented some degree of TMD, while after 10 years, 70% of individuals had the disorder. Such a scenario agrees with Souza et al.[21], who found a relationship between the time of edentulism and the time using total prostheses, with TMD presence.

Through the anamnestic index, the analysis concluded that out of the 154 patients examined, 64 (41.6%) did not have TMD, 61 (39.6%) had mild TMD, 23 (14.9%), had moderate, and only 6 (3.9%) presented severe TMD. The quality index of total prostheses revealed that 78 (50.6%) of the completely toothless patients had TPs considered satisfactory, while 76 (49.4) had unsatisfactory prostheses. Thus, we suggest that further studies assess the impact of prosthesis quality on TMD prevalence and the quality of life of individuals with total prostheses.

CONCLUSION

Considering our results, it would be premature to affirm categorically that old and unsatisfactory prostheses are determinant etiological factors for TMD. However, we can conclude that managing the condition of the prosthesis is the professional's responsibility and can provide the patient with comfort and normality of the masticatory function. Finally, associated with other therapeutic modalities for TMD, this could facilitate the rebalancing of the patient's stomatognathic system.

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CONFLICTS OF INTERESTS

The authors declare no conflicts of interest.

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