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Study of prosthetic risk factors on the manducatory apparatus related to the wearing of partial dentures in patients with recessed edentulism

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KEY WORDS

Partial prosthesis, conjoint prosthesis, Partial recessed edentulous, Manducatory apparatus dysfunction, prosthetic occlusion

Abstract

Background. Partial dentures are widely used to restore oral function in patients with partial tooth loss; however, improper fit can lead to dysfunction of the manducatory apparatus. This study explores the association between partial denture use and manducatory dysfunction, identifying specific prosthetic risk factors in patients with recessed edentulism.

Methods-A case-control study was conducted with 594 patients (297 cases and 297 controls) aged 18 to 66, recruited from public and private dental practices. Data were collected through clinical examinations and structured assessments, analyzing general factors such as age, gender, and psychological profile, alongside prosthetic factors.

Results - The findings revealed a significant association between partial denture use and manducatory dysfunction with an adjusted OR of 1.69 (95% CI [1.18-2.4], P = 0.003). Key risk factors include denture age over 5 years, instability, and protrusive interference, with adjusted ORs of 2.93, 2.55, and 2.17, respectively (P< 0.05).

Conclusion -This study highlighted critical prosthetic factors associated with manducatory dysfunction in partial denture wearers with recessed edentulism, underscoring the need for a preventive and therapeutic prosthetic approach that includes regular screening and maintenance. Future longitudinal studies are recommended to explore causal relationships and refine preventive strategies in prosthetic care.

1. Introduction

The functioning of the musculoskeletal system depends on the balance between its components (neuromuscular, osteoarticular and dental), which are physiologically inseparable. In patient without dysfunction of the manducatory apparatus (TMD), a balance is established between these components. However, this balance can be disturbed by a number of etiological factors, leading to the onset of pathology) [1].

Costen (1934) was the first to establish a link between occlusion in particular and the development of pathology [2]. This finding has been confirmed by a number of studies showing a significant association between malocclusion and TMD, the odds ratios ranged from 2.18 to 3.77, and the p-values were less than 0.05 [3-7], and refuted by others concluding that isolated occlusal factors cannot cause TMD [8-11].

In addition to occlusion, Travel (1952) and Schwartz (1956) proposed the neuromuscular theory. According to Schwartz (quoted by Rozencweig 1994), a muscular imbalance would lead to overloading and over functioning of the muscles required to maintain the mandible in space, which would be the cause of painful symptoms in TMD [12].

Prosthetic dentistry is based on these two theories. When a dentist performs a prosthetic treatment, he or she ensures that the occlusal relationship between the two jaws is maintained over the long term. This treatment must ensure a state of neuromuscular relaxation. If this treatment is ill-adapted or poorly balanced, it can induce faulty occlusal contacts responsible for an eccentric position of the condyles in their temporal fossa, leading to pain and dysfunction (Costen theory) and/or disturbances in muscle activity (Travel and Schwarts theory).

However, as the responsibility of the prosthesis has not been scientifically proven, this question, like that of occlusion, is highly controversial. Some studies have failed to identify a statistically significant association between TMD and dentures [13, 14]. However, other researchers indicate that individuals who wear dentures have a higher prevalence of TMD-related symptoms compared to those with natural teeth [15, 16]. Divaris and al [17] have stated that prosthetic instability is involved in muscle contractions. In some studies, iatrogenic prosthesis renewal seemed to reduce symptoms [18], a result that is not sustainable according to Tomas Magnusson [19]. Nevertheless, other researchers found no association between prosthesis quality (mandibular retention ($p = 0.466$); mandibular stability ($p= 0.466$); inter-occlusal distance ($p = 0.328$); centric relationship ($p = 0.175$); and balanced occlusion ($p= 0.56$) [20, 21].

On the contrary, studies have demonstrated a rate of adaptation to an incorrect DV of 86% to 100% for removable prostheses and 100% for fixed devices [22]. We have noted that most of these studies on TMD in edentulous focus on distal class partial edentulous and/or total denture populations. Very few studies have been carried out on subjects wearing prostheses restoring recessed edentulous teeth, despite the fact that the impact of this type of prosthesis on the manducatory apparatus should not be overlooked.

Partial dentures are very often incorporated into a disturbed stomatognathic system, where changes in the occlusal vertical dimension are frequently observed, caused either by the absence of cuspid teeth or the wear of the remaining natural teeth. In the face of uncompensated edentulism, dental, periodontal, muscular and articular structures adapt, leading to more complex occlusal situations [23]. Such a situation requires the dentist to carry out a preliminary conditioning; otherwise the prosthesis could aggravate these disorders.

Given the close relationship between partial dentures, the musculoskeletal system and occlusion, we believe it would be useful to investigate a possible link between partial dentures and TMD, and to identify the prosthetic factors associated with its occurrence in subjects with partial dentures restoring a recessed edentulous tooth, noting that few studies have focused on this population.

2. Materials & Methods

The retrospective analytical case-control study was conducted out over a period of two years ending in 2018; it focused on patients consulting in private and public dental clinics in the city of Oran. This study included 594 patients 297 with TMD and 297 without TMD, aged 18 or over and presenting one or more recessed partial edentulous teeth. Non-included patients were those refusing to wear their dentures, patients with non-dysfunctional musculoskeletal disorders, patients with pain other than oro-facial musculoskeletal pain, patients with ongoing occlusal splint or dentofacial orthopedics treatment, and patients who had undergone general anesthesia or wisdom tooth extraction. To avoid selection bias, we recruited «control» patients in the same institutions and during the same period.

Data were collected retrospectively, using an examination tray, a 20-centimeter ruler, a criterium pencil, a waterproof pencil, a household scale, a stethoscope, occlusal paper and pads for drying dental surfaces, and with the aid of a data collection sheet designed according to the objectives assigned to this study (**Figure 1**).

Figure 1. Instrumentation

To characterize patients with TMD, we chose to use the technique proposed by Daniel ROZENCWEIG [12] because of its simplicity, ease, speed of implementation and low cost.

To characterize patients with psychological disorders, we used the HADS (Hospital Anxiety and Depression Scale), a self-administered questionnaire proposed by Zigmon and Snaith [24]. The method used to assess retention and stability of a removable prosthesis was identical to that used by Humme SK and al. and MacEntee and Wyatt [25, 26].

The balance of the fixed prosthesis is considered a failure only when the patient reports loosening of the prosthesis. Otherwise, it is considered assured. Wear of the prosthetic occlusal surface can be confirmed by a simple visual examination of the prosthetic teeth. If the teeth are made of resin, the cusp morphology will disappear (**Figure 2**), while in the case of porcelain teeth, fractures will be observed (**Figure 3**).

Figure 2. Wear of resin teeth

Figure 3. Fracture of cosmetic parts of bridges

Determining the age of the prosthesis relies on the patient's responses, which introduces subjectivity due to memory dependency. In cases where a patient wears several prostheses of different ages, the age of the oldest prosthesis is taken into account.

The vertical dimension is assessed using a ruler to measure and compare the distance between the external angle of the eye and the labial commissure, as well as the distance between the subnasal point and the gnathion point.The prosthetic occlusal plane can be considered normal if it respects Spee's and Wilson's curves (**Figure 4**).

Figure 4. Disturbed prosthetic occlusal plane

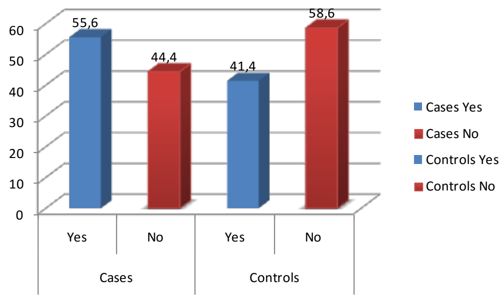
To visualize prematurities and interferences, we use articulated paper. When a dental reference is required in a clinical situation, the mandibular position must correspond to the position of maximum intercuspidation (IMO). If the reference is articular, the DAWSON technique is used. This method entails the tracing of marks on the prosthetic teeth of both arches in the customary mandibular position. The practitioner positions his thumbs at chin level to direct the mandible, while the remaining fingers provide support for the horizontal branch of the mandible, facilitating its elevation and the positioning of the condyles in a superior and anterior position. Subsequently, the concurrence of the traced marks is verified in this novel position.In order to minimize the study bias of information, the number of investigators was limited to four: two evaluated the signs and symptoms of TMD, while the other two for prosthetic evaluation. All received theoretical and practical training to ensure consistency, with examination techniques repeated five times per investigator as part of a pilot study. The study was double-blind, with investigators and data entry staff unaware of the study objectives and each other's results. The sample size was calculated using BiostaTGV, and data entry and analysis were performed in SPSS 20.0. Descriptive statistics, Pearson's chi-square test and Student's t-test were applied to analyze TMD and general parameters such as gender, age and psychological profile. Univariate and multivariate regression analyzes examined associations between TMD and various parameters, with model fit confirmed by the Hosmer and Lemeshow test. The same approach was used to identify prosthetic factors related to TMD.

3. Results

Our study population comprised 297 TMD «cases» and 297 «controls», of which 68.4% were women and 31.6% men. Mean age was 37.52 ± 11.17 years, with extremes ranging from 18 to 66 years. The psychological symptomatology of the «cases» and «controls» was predominantly «doubtful». The distribution of the sample between «cases» and «controls» was very significantly different (p=10-3). The «case» group included more partial denture wearers (55.6%) than non-wearers (44.4%). The «control» group showed the opposite pattern (**Figure 5**).

The univariate analysis confirmed a positive relationship between the four factors and the development of TMD, as indicated by the crude odds ratios as shown in **Table 1**.

Figure 5. Distribution of patients according to partial denture wear



All statistically significant differences were retained in the final model in the multivariate analysis, as shown in **Table 2**.

In this population, the risk of developing TMD is almost twice as high in partial denture wearers as in those without.

The data collected in our form enabled us to identify the most important prosthetic risk factors associated with TMD through univariate analysis.

These factors are the age of prosthesis; prosthetic stability; prosthetic retention; prosthetic tooth wear; POP; prosthetic prematurity; prosthetic protrusive interference and prosthetic diductive interferences (**Table 3**).

Multivariate analysis, using logistic regressions across eight steps, identified significant prosthetic risk factors. Model fit was confirmed by the Hosmer and Lemeshow test (p=0.19).

Key findings indicate that prostheses over five years old present a threefold higher risk of TMD, followed by prosthetic instability, which increases TMD risk by 2.55 times, and protrusive interferences, which double the risk (**Table 4**).

Table 1. Descriptive and univariate analysis of «cases» and «controls» according to general parameter

	Variable	Study population n=594	Cases n=297	Controls n=297	ORb	IC à 95%	P
Age	Age (years)	37.52± 11.17	40.49±11.8	34.55±9.66			
	Minimum age	18	18	18	1.05	1.03-1.06	$<10^{-3}$
	Maximum age	66	66	51			
Gender	Male	188 (31.6%)	82 (27.6%)	106 (35.7%)			
	Female	406 (68.4%)	215 (72.4%)	191 (64.3%)	1		
	Sex ratio	2.15	2.62	1.8	1.4	1.02-2.06	0.03
Psychological symptoms	Absent	102 (17.2%)	21 (7.1%)	81 (27.3%)	1		
	Doubtful	477 (80.3%)	264 (88.9%)	213 (71.7%)	4.78	2.86-7.98	$<10^{-3}$
	Certain	15 (2.5%)	12 (4%)	3 (1%)	15.42	3.98-59.70	$<10^{-3}$
Wearing a Prosthesis	No	306 (51.5%)	132 (44.4%)	174 (58.6%)	1		
	Yes	288 (48.5%)	165 (55.6%)	123 (41.4%)	1.76	1.27-2.44	0.001

Table 2. Multivariate analysis

Explanatory variables	Crude OR	Adjusted OR	IC à 95%	P
Age	1.05	1.03	1.01-1.05	10^{-3}
Gender				
Male	1			
Female	1.45	1.47	1.01-2.14	0.4
Psychological symptoms				
Absent	1			
Doubtful	4.78	3.83	2.23-6.57	10^{-3}
Certain	15.42	7.18	1.78-29.01	0.006
Wearing a prosthesis				
No	1			
Yes	1.76	1.69	1.18-2.40	0.003

Table 3. Univariate analysis of prosthetic factors

Variable	Crude OR	IC (95%)	P
Age of prosthesis			
5 and under	1		
More than 5 years	3.15	1.93-5.14	$<10^{-3}$
Prosthetic arch			
Unimaxillary	1		
Bimaxillary	0.67	0.40-1.13	0.13
Type of prosthesis			
Fixed	1		
Removable	1.34	0.81-2.22	0.24
Tooth material			
Ceramic	1		
Resin	0.58	0.28-1.20	0.14
Stability			
Assured	1		
Not assured	3.23	1.97-5.28	$<10^{-3}$
Retention			
Insured	1		
Not insured	2.95	1.82-4.79	$<10^{-3}$
Dental wear			
No	1		
Yes	2. 29	1.42-3.70	0.001
Vertical dimension			
Correct	1		
Not correct	0.65	0.37-1.13	0.23
Reproducibility of Mandibular position Yes	1		
No	1.52	0.76-3.04	0.23
POP			
Normal	1		
Disturbed	1.74	1.07-2.83	0.02
Prematurity			
No	1		
Yes	1.75	1.05-2.90	0.03
Protrusive interference			
No	1		
Yes	2.56	1.57-4.17	$<10^{-3}$
Diductive interference			
No	1		
Yes	2.30	1.41-3.77	0.001

Table 4 . Results of multiple logistic regression analysis: final model obtained by Wald's top-down stepwise method

Explanatory variables	Adjusted OR	IC (95%)	P
Age of prosthesis			
5& under	1		
More than 5 years	2.93	1.75-4.90	$<10^{-3}$
Protrusive interference			
No	1		
Yes	2.17	1.28-3.6	0.04
Stability			
Assured	1		
Not assured	2.55	1.51-4.29	$<10^{-3}$

Discussion

Although TMD is not a rare disease in the population, a case-control study was selected as the most appropriate methodology for achieving the study's objectives for the following reasons: Firstly, this type of investigation enables the examination of multiple factors associated with TMD, which aligns well with our objective of evaluating the impact of partial dentures on the development of TMD and identifying prosthetic risk factors. Secondly, from an ethical standpoint, it is not feasible to conduct a clinical trial, which would entail exposing a subject to prosthetic factors that may be erroneous and following them over time. The study is retrospective in design, rather than prospective.

Despite the inherent limitations of this approach, several measures have been implemented to minimise potential sources of bias. To reduce selection bias, samples were selected at random from multidisciplinary structures. Logistic regression was employed to limit residual bias by analysing interactions between variables. However, memory bias remained, making it impossible to establish the precise chronology between the wearing of prostheses and the onset of TMD. The difficulty of recruiting comparable controls, the over-representation of symptomatic subjects, and the heterogeneity of evaluation criteria and methods between studies also complicate the interpretation and comparison of results.

Considering that TMD is a multifactorial pathology, we have considered only the risk factors most frequently mentioned in the literature: age, gender and psychological profile. Age seems to be significantly associated with the occurrence of TMD (p<10-3), although with an apparently low risk (adjusted OR =1.03). We can therefore conclude that for every year of age, the risk of developing TMD increases by 1.03.

Our result, which is related to the notion of a correlation between advancing age and the occurrence of TMD, is at odds with the majority of studies dealing with TMD in elderly subjects [27]. The authors attribute this to the fact that these categories readily accept any form of discomfort or dysfunction due to the normal aging process and therefore do not present complaints of TMD. We can attribute the discrepancy between our result and theirs to the fact that we didn't have many elderly subjects in our sample. The WHO defines an elderly person as being over 60 years of age [28]. In our study, the latter are a minority (17 patients or 2.9% of the general population), the oldest being 66 years old.

In our «case» sample, we had more women (215 patients) than men, with a sex ratio of 2.15. The adjusted OR was slightly higher than the crude OR, expressing a 1.53 risk of developing TMD in women. Our results are consistent with the literature evaluating TMD in dentate individuals, partial denture wearers, and total denture wearers, who are predominantly female, with a sex ratio of approximately 2.1 [29-31] Bush speculates that this finding is due to the fact that women also appear to be more likely to seek advice, more attentive to their symptoms, and more likely to seek treatment compared to men [32]. Allosi S. reflects biological differences [33]. The psychosocial aspect also comes into play, as women are more confronted with and sensitive to stress than men [34].

Psychological factors have been shown to be associated with TMD: patients with questionable psychological symptoms are almost 5 times more likely to develop TMD than those with no symptoms, while those with definite symptoms are 7.34 times more likely.

Our observation is consistent with a large number of studies evaluating the role of psychological factors in the genesis of TMD. The one conducted by Vasudeva and al in 2014 [35] attempted to investigate the role of anxiety and depression in the genesis of TMD, using the HADS scale as a means of psychological assessment and thus comparing the scores between patients with TMD and control patients. They found a higher incidence of abnormal levels of anxiety and depression in TMD subjects than in the control group. These findings are consistent with several studies that have reported a positive relationship between anxiety, depression, and TMD [36, 37] including the results of our research.

Anxiety and other psychological disorders are thought to act as triggers for TMD by lowering the resistance threshold of the maducatory apparatus, exacerbating muscle contracture, and increasing parafunctions [38].

Our results show an even distribution of patients according to whether they wore a partial prosthesis or not. However, this distribution differed between the «case» and «control» groups (55.6% of affected subjects wore a partial prosthesis and 58.6% of controls were not fitted), and an association between TMD and prosthesis (OR=1.76; [1.27-2.44]) was observed in patients wearing a partial prosthesis.

When sex, age, and psychological profile were added to the predictive model in the multivariate analysis, this association remained significant (OR=1.69; [1.18-2.40]).

The role of prostheses on the musculoskeletal system is controversial. There are those who support the theory that the prosthesis plays a role in the genesis of TMD, which supports our result. On the other hand, there are those who disagree with the prosthesis-TMD association and argue the opposite. Osama A. Al-Jabrah and al, Thaisa Bordin and al, Preeti Agarwal and al found that signs and symptoms of TMD are quite common in partial denture wearers [39-41].

Osama A. Al-Jabrah and al concluded that prosthesis wearers are predisposed to developing TMD and that the prevalence of TMD is higher in removable partial denture (RPD) wearers than in removable complete denture (RCD) wearers. The authors explain this by the fact that 70% of PPA wearers have malocclusions responsible for TMJ changes [39]. Thaisa Bordin and al. report that their sample is predominantly female and middle-aged, and that the latter are highly predisposed to developing this type of dysfunction [40]. Preeti Agarwal and al. found that partial and total prostheses and their poor condition were associated with an increased incidence of signs and symptoms of TMD compared to subjects without prostheses [41].

Other researchers share this view and have conducted clinical studies in patients with TMD to evaluate the impact of prosthetic restoration and partial and/or total repair of iatrogenic prostheses on the clinical picture. Amorim and Paula Eduardo conclude that a partial prosthesis of good overall quality and suitable occlusal condition has a favorable effect on the position of the condyles and maintains their centration in the glenoid cavity, leading to a reduction in joint pain [42].

Dervis concluded that the clinical dysfunction index was reduced after prosthetic treatment. However, this initial beneficial effect was not sustained due to the lack of regular follow-up to monitor occlusion, retention, prosthetic stability, and vertical dimension [21].

Contrary to our result, there are those who disagree with the association between prosthesis and TMD. F. Rostamkhani, and Jainane Augusta contradict the hypothesis that deficient prosthetic conditions can lead to the genesis of TMD [14, 20]. These studies were performed in patients with total dentures, in whom the forces generated during mastication are reduced and rarely exceed the threshold of tissue adaptability.

On the other hand, our sample is composed of patients with deep edentulous teeth, who can generate excessive occlusal loads on the remaining teeth, especially in the presence of abnormal dento-dental relationships and hard feeding, which is still possible for them compared to subjects with distal partial or total edentulous teeth. All these conditions favor the development of TMD. Another point that may explain our results is that edentulism worsens aesthetics and alters the psychological profile, which has repercussions on the state of the masticatory apparatus.

In fact, this divergence of results is due to the fact that the objectives set were different and to the heterogeneity of the type of study and the populations studied.

Our second objective was to identify prosthetic factors that could be considered risk factors. We began with the age of the prosthesis, noting that prosthesis more than 5 years old was 3 times more likely to cause TMD than prosthesis 5 years old or less. Bontempo, Bordin and Preeti Agarwal observed that wearing the same prosthesis for a prolonged period of time (more than 5 years) causes wear of the occlusal surfaces of the artificial teeth, inducing a change in vertical dimension of occlusion, thus facilitating the development of TMD [40,41,43] Yannikakis refuted this association by showing no significant prevalence of TMD in relation to the age of the prosthesis worn [44].

This is probably due to the small sample size (251 patients) and the fact that the majority of patients included do not wear their prosthesis frequently. On the other hand, long-term wearing of a prosthesis without periodic checks and adjustments causes wear of the occlusal surfaces of the prosthetic teeth, poor prosthetic adaptation and occlusal instability, which weakens the components of the masticatory apparatus and leads to the development of TMD [17].

Regarding the type of prosthesis, it is known that the removable partial prosthesis, which is mobile, has more stability problems and requires more effort than the fixed joint prosthesis, so the consequences are more significant. By studying the two types of prosthesis separately, we were able to estimate the same impact on the manducatory apparatus.

This similarity is probably due to the fact that we included partially edentulous patients in our study; in this category of patients, the posterior teeth are present to ensure wedging and the removable prosthesis is in an occlusal scheme close to that of the fixed prosthesis.

Helme, Raad M and al. conducted a study on the state of the mandibular apparatus using Cadiax compact 2 to assess mandibular movements after the insertion of a fixed prosthesis. The study found no significant change. However, the duration of follow-up may explain the discrepancy, as it was too short for any impact to be felt [45].

A causal link was established between the explanatory variable and the two variables to be explained (OR=3.23 for instability, OR=2.95 for lack of retention) with a high level of significance ($p<10^{-3}$). Previous studies have reported no relationship between retention, stability, and TMD [14] [21], while other studies, including those by K. Sipila, Bordin, and Osama A. Al-Jabrah, support our findings [13,39,40]. The difference in results can be attributed to variations in study design and subject inclusion methods.

Our sample consisted mostly of females, who are known to experience accelerated resorption of edentulous ridges. This resorption may be partially caused by a mismatch between the prosthesis and the ridge. Improperly fitting prostheses can cause constant muscular contractions in an attempt to stabilize the prosthesis, resulting in pain and muscular dysfunction. There is still disagreement regarding the role of loss of vertical dimension in the etiology of TMD. Studies have shown that deviations in the vertical dimension of existing prostheses do not cause TMD, as long as they are minimal, symmetrical, and progressive. According to some, a defective vertical dimension is the most common factor in TMD and is positively correlated with muscle hyperactivity due to incorrect mandibular position.

However, based on the results of this study, it can be suggested that the association is actually inverse, and that the correct vertical dimension is a protective factor in preventing TMD. Theoretically, loss of vertical dimension and wear are linked. The study found that the wear of prosthetic teeth increases the risk of developing TMD by 2.29 times. However, our sample consisted of patients with recessed edentulous teeth, and despite the wear of the prosthetic teeth, the vertical dimension of occlusion remained preserved thanks to the posterior teeth. In this case, wear could affect both static and dynamic occlusal contacts, creating premature contacts and interferences instead of changing the vertical dimension of occlusion. These premature contacts and interferences can cause mandibular deviations and muscle pain.

The analysis shows a significant association between protrusive interference and TMD. Several studies have investigated occlusal contact as a risk factor for TMD. Premature contact is defined as the first inter-dental contact that occurs on the closure path in centric relation occlusion (CRO) and may cause mandibular elevation deviations [46]. These reflex deviations could increase the risk of masticatory muscle pain following overload [4, 47].

Landi and al. identified prematurity as a factor that could cause muscle pain, with an odds ratio of 2.57 [4]. Amini and al. (2000) pointed out that the loss of a certain number of teeth may cause adjacent teeth to tilt towards the edentulous zone, resulting in premature contacts responsible for temporomandibular joint (TMJ) disorders and changes in condylar position [48].

However, studies by Boever [49] and Bourezgui [11] found no correlation between signs and symptoms of TMD and factors related to occlusal status. This discrepancy could be explained by methodological differences, in particular the definition of malocclusions and the populations studied. Unlike the work of Boever and Bourezgui, our study focuses on patients with recessed partial edentulism, a condition that favours excessive occlusal loads and functional imbalances.

As our study was retrospective, we could not determine the time of onset of TMD. Disturbances in occlusal relationships are often linked to tooth displacement due to edentulism, which may have caused TMD even before the prosthesis was fitted. Differences in results may be due to the heterogeneity of sample sizes, methodologies adopted, and occlusal factors studied. The definition of malocclusion varies among authors. Some researchers focus on “functional malocclusions” or “interferences”, while others also include “morphological malocclusions”. Due to the subjective nature of malocclusion evaluation, it is understandable that different authors may draw different conclusions regarding the correlation between malocclusions and TMD.

Conclusion

The results of our case-control epidemiological study indicate a significant correlation between the presence of prostheses and TMD in patients with recessed partial edentulism. By identifying key risk factors such as prosthetic age, stability, and protrusive interference, our findings contribute to a deeper understanding of the complex aetiology of TMD in this specific population. This study not only emphasises the significance of prosthetic design and maintenance but also offers invaluable insights for clinicians seeking to mitigate TMD risk through preventive and corrective measures.

These results emphasise the necessity for longitudinal studies to elucidate the causal relationships and temporal dynamics between prosthesis use and TMD onset. Although there is a potential for recall bias inherent in retrospective designs, our findings provide a foundation for further research and emphasise the clinical relevance of regular prosthetic evaluation. By identifying and addressing modifiable risk factors, this study makes a significant contribution to the advancement of prosthodontic practices and the improvement of patient care outcomes, particularly for individuals with recessed partial edentulism.

Conflicts of interest

The authors have no conflicts of interest to declare.

References

[1] LAPLANCHE, O., EHRMANN, Elodie, & PEDEUTOUR, P. (2012). Classification diagnostique clinique des DAM (Dysfonctionnements de l'Appareil Manducateur). Rev Orthop Dento-Faciale, 46(1), 9–32. https://doi.org/10.1051/odf/2012102

[2] COSTEN, J. B. (1934). Syndrome of ear and sinus symptoms dependent upon disturbed function of the temporomandibular joint. Annals of Otology, Rhinology & Laryngology, 43(1), 1–15.

[3] WANG , Chen , & YIN, X. (2012). Occlusal risk factors associated with temporomandibular disorders in young adults with normal occlusions. Oral Surg Oral Med Oral Pathol Oral Radiol, 114(4), 419–423. https://doi.org/10.1016/j.oooo.2011.10.039

[4] LANDI, N., MANFREDINI, D., & TOGNINI, F. (2004). Quantification of the relative risk of multiple occlusal variables for muscle disorders of the stomatognathic system. The Journal of Prosthetic Dentistry, 92(2), 190–195. https://doi.org/10.1016/j.prosdent.2004.05.013

[5] CHISNOIU, Andrea M, BUDURU, S., & LASCU, L. (2015). Influence of occlusal characteristics on temporomandibular joint disorder development–a cross-sectional study. Human and Veterinary Medicine, 7(3), 197–201.

[6] SÁNCHEZ-PÉREZ, Leonor, IRIGOYEN-CAMACHO, M. E., & MOLINA-FRECHERO, N. (2013). Malocclusion and TMJ disorders in teenagers from private and public schools in Mexico City. Medicina Oral, Patologia Oral y Cirugia Bucal, 18(2), 312–318. https://doi.org/10.4317/medoral.18075

[7] HARALUR, S. B., ADDAS, Mohamed Khaled, & OTHMAN, H. I. (2014). Prevalence of malocclusion, its association with occlusal interferences and temporomandibular disorders among the Saudi sub-population. Oral Health Dent Manag, 13(2), 164–169.

[8] Manfredini, D., Perinetti, G., & Stellini, E. (2015). Prevalence of static and dynamic dental malocclusion features in subgroups of temporomandibular disorder patients: implications for the epidemiology of the TMD-occlusion association. Quintessence Int, 46, 341–349. https://doi.org/10.3290/j.qi.a32986

[9] BELOTTE-LAUPIE, L., SAYAGH, Milléwa, & MANIÈRE-EZVAN, Armelle. (2011). Dysfonctionnement de l'appareil manducateur et malocclusions: existe-t-il une relation?-Revue systématique de la littérature de 2000 à 2009. Revue d'Orthopédie Dento-Faciale, 45(2), 197–206. https://doi.org/10.1051/odf/2011206

[10] PULLINGER, A. G., SELIGMAN, D. A, & GORNBEIN, J. A. (1993). A multiple logistic regression analysis of the risk and relative odds of temporomandibular disorders as a function of common occlusal features. Journal of Dental Research, 72(6), 968–979. https://doi.org/10.1177/002203459307200613

[11] BOURZGUI, Farid, SEBBAR, M., & FEHRI, S. F. (2009). Dysfonctionnement cranio-mandibulaire et malocclusions. International Orthodontics, 7(2), 170–180. https://doi.org/10.1016/S1761-7227(09)74624-8

[12] ROZENCWEIG, D. (1994). Algies et dysfonctionnements de l'appareil manducateur: propositions diagnostiques et thérapeutique. Paris : Editions CdP.

[13] SIPILÄ, K., Näpänkangas, R., Könönen, M., Alanen, p, & Suominen, A. L. (2013). The role of dental loss and denture status on clinical signs of temporomandibular disorders. Journal of Oral Rehabilitation, 40(1), 15–23. https://doi.org/10.1111/j.1365-2842.2012.02345.x

[14] ROSTAMKHANI, F., TAYARANI, Nilufar, & MADANI, A. S. (2015). The relationship between temporomandibular disorders (TMDs) and overall denture conditions in complete denture wearers. Journal of Dental Materials and Techniques, 4(2), 101–110. https://doi.org/ 10.22038/jdmt.2015.4128

[15] DULČIĆ, Nikša, PANDURIĆ, J., & KRALJEVIĆ, Sonja. (2003). Incidence of temporomandibular disorders at tooth loss in the supporting zones. Collegium Antropologicum, 27(2), 61–67.

[16] HARRIMAN, Linda P., SNOWDON, D. A., & MESSER, L. B. (1990). Temporomandibular joint dysfunction and selected health parameters in the elderly. Oral Surgery, Oral Medicine, Oral Pathology, 70(4), 406–413. https://doi.org/10.1016/0030-4220 (90)90199-3

[17] DIVARIS, K., NTOUNIS, A., & MARINIS, A. (2012). Loss of natural dentition: multi-level effects among a geriatric population. Gerodontology, 29(2), 192–199. https://doi.org/10.1111/j.1741-2358.2010.00440.x

[18] LUNDEEN, T. F., SCRUGGS, R. R., & MCKINNEY, M. W. (1990). TMD Symptomology among Denture Patients. Journal of Craniomandibular Disorders, 4(1), 40–46.

[19] MAGNUSSON, T. (1985). Signs and symptoms of mandibular dysfunction in complete denture wearers five years after receiving new dentures. A Clinical Follow-Up Study. CRANIO®, 3(3), 267–272. https://doi.org/10.1080/08869634.1985.11678109

[20] RIBEIRO, Jaiane Augusta Medeiros, DE RESENDE, C. M. B. M., & LOPES, A. L. C. (2014). Association between prosthetic factors and temporomandibular disorders in complete denture wearers. Gerodontology, 31(4), 308–313. https://doi.org/https://doi.org/10.1111/ger.12048

[21] DERVIS, E. (2004). Changes in temporomandibular disorders after treatment with new complete dentures. Journal of Oral Rehabilitation, 31(4), 320–326. https://doi.org/https://doi.org/10.1046/j.1365-2842.2003.01245.x

[22] ABDUO, J. (2012). Safety of increasing vertical dimension of occlusion: a systematic review. Quintessence International, 43(5), 369–38

[23] ESCLASSAN, R., ESCLASSAN-NOIRRIT, E., & LACOSTE-FERRÉ, M.-H. (2004). Prothèse adjointe partielle: occlusion, choix et montage des dents. Polymérisation des bases. EMC-Dentisterie, 1(1), 2–24. https://doi.org/https://doi.org/10.1016/j.emcden.2003.11.005

[24] ZIGMOND, A. S., & SNAITH, R. P. (1983). The hospital anxiety and depression scale. Acta Psychiatrica Scandinavica, 67(6), 361–370. https://doi.org/https://doi.org/10.1111/j.1600-0447.1983.tb09716.x

[25] HUMMEL, S. K., WILSON, M. A., & MARKER, V. A. (2002). Quality of removable partial dentures worn by the adult US population. The Journal of Prosthetic Dentistry, 88(1), 37–43. https://doi.org/https://doi.org/10.1067/mpr.2002.126845

[26] MACENTEE, M. I., & WYATT, C. C. . (1999). An index of clinical oral disorder in elders (CODE). Gerodontology, 16(2), 85–96. https://doi.org/https://doi.org/10.1111/j.1741-2358.1999.00085.x

[27] CAMACHO, J., OLTRAMARI-NAVARRO , P., & NAVARRO , R. (2014). Signs and symptoms of temporomandibular disorders in the elderly. CoDAS, 26(1), 76–80. https://doi.org/ https://doi.org/10.1590/S2317-17822014000100011

[28] SHETTY, R. (2010). Prevalence of signs of temporomandibular joint dysfunction in asymptomatic edentulous subjects: a cross-sectional study. The Journal of Indian Prosthodontic Society, 10(2), 96–101. https://doi.org/10.1007/s13191-010-0018-9.

[29] KOWAL, P., & DOWD, J. E. (2001). Definition of an older person. Proposed working definition of an older person in Africa for the MDS Project. World Health Organization, Geneva, 10(2), 5188–9286. https://doi.org/10.13140/2.1.5188.9286

[30] ALZAREA, B. K. (2017). Prevalence of temporomandibular dysfunction in edentulous patients of Saudi Arabia. Journal of International Oral Health, 9(1), 1–5. https://doi.org/10.4103/jioh.jioh_25_16

[31] SHET, R. G. K., RAO, S., & PATEL, Ruchi. (2013). Prevalence of temporomandibular joint dysfunction and its signs among the partially edentulous patients in a village of North Gujarat. J Contemp Dent Pract, 14(6), 1151–1155. https://doi.org/10.5005/jp-journals-10024-1466

[32] BUSH, F. M., HARKINS, S. W., & HARRINGTON, W. G. (1993). Analysis of gender effects on pain perception and symptom presentation in temporomandibular pain. Pain, 53(1), 73–80. https://doi.org/https://doi.org/10.1016/0304-3959(93)90058-W

[33] ALOOSI, S. N., MOHAMMAD, S. M, & QARADAKHY, T. A. (2016). Contribution of cervical spine in temporomandibular joint disorders: A cross-sectional study. J Interdiscipl Med Dent Sci, 4(204). https://doi.org/10.4172/2376-032X.1000204

[34] ANDOH, A., RIACHI, N., & SAYAH, A. (2002). La prevalence des dysfonctions craniomandibulaires chez les patients ages. Le Courrier Du Dentiste.

[35] VASUDEVA, S., IYENGAR, A., & SEETARAMAIAH, Nagesh. (2014). Correlation of anxiety levels between temporomandibular disorder patients and normal subjects. Journal of Oral Diseases, 2014(1). https://doi.org/ https://doi.org/10.1155/2014/579674

[36] FERREIRA, C. L. P., SILVA, M. A. M., Rodrigues , D., & MARIA DE FELÍCIO, C. (2009). Orofacial myofunctional disorder in subjects with temporomandibular disorder. CRANIO®, 27(4), 268–274. https://doi.org/https://doi.org/10.1179/crn.2009.038

[37] FILLINGIM, R. B., OHRBACH, R., & GREENSPAN, Joel D. (2011). Potential psychosocial risk factors for chronic TMD: descriptive data and empirically identified domains from the OPPERA case-control study. The Journal of Pain, 12(11), 46–60. https://doi.org/https://doi.org/10.1016/j.jpain.2011.08.007

[38] ANDRE, H. (1992). Psicologia odontoiatrica. Paris : Masson, Milano.

[39] OSAMA, A. A.-J., & YOUSEF, R. A.-S. (2006). Prevalence of temporomandibular disorder signs in patients with complete versus partial dentures. Clin Oral Investig, 10(3), 167–173. https://doi.org/10.1007/s00784-006-0046-3

[40] BORDIN, Thaisa B, CONCI, R. A., & PEZZINI, M. M. (2013). Prevalence of signs and symptoms of temporomandibular disorders (TDM) in patients wearing bimaxillary complete dentures, removable partial dentures and in students with natural dentition. Acta Odontológica Latinoamericana, 26(3), 173–180.

[41] KATYAYAN, P. A., KATYAYAN, Manish Khan, & PATEL, G. C. (2016). Association of edentulousness and removable prosthesis rehabilitation with severity of signs and symptoms of temporomandibular disorders. Indian Journal of Dental Research, 27(2), 127–136. https://doi.org/10.4103/0970-9290.183129

[42] AMORIM, V. C. P., LAGANÁ, D. C., & DE PAULA EDUARDO, José Virgilio. (2003). Analysis of the condyle/fossa relationship before and after prosthetic rehabilitation with maxillary complete denture and mandibular removable partial denture. The Journal of Prosthetic Dentistry, 89(5), 508–514. https://doi.org/https://doi.org/10.1016/S0022-3913(03)00029-5

[43] BONTEMPO, K. V., & ZAVANELLI, R. A. (2011). Desordem temporomandibular: prevalência e necessidade de tratamento em pacientes portadores de próteses totais duplas. RGO. Revista Gaúcha de Odontologia, 59(1), 87–94.

[44] YANNIKAKIS, Stavros, ZISSIS, A., & HARRISON, A. (2009). The prevalence of temporomandibular disorders among two different denture-wearing populations. The European Journal of Prosthodontics and Restorative Dentistry, 17(1), 35–40.

[45] ABDULLA, H. I., ALI, A. A., & HELME, R. (2011). Evaluation of the effects of fixed partial denture on the Temporomandibular joint dysfunction by using Cadiax compact. Journal of Baghdad College of Dentistry, 23(1), 39–46.

[46] BARALE, G., FLEITER, G., & HIPOLYTE, M. (2001). Lexique - Occlus odontologie. Paris : Quintessence International.

[47] OKESON, J. P. (2019). Management of temporomandibular disorders and occlusion (8th Ed.). St. Louis: Mosby.

[48] AMINI, P., & SADEGHI, M. (2000). Prevalence rate of temporomandibular joint disorders in partial edentulous patients referring to the dental school of Rafsanjan in 1998. . . J Kerman Univ Med Sci, 7(2), 79–84.

[49] DE BOEVER, J. A, CARLSSON, G. E., & et KLINEBERG, I. J. (2000). Need for occlusal therapy and prosthodontic treatment in the management of temporomandibular disorders. Part II: Tooth loss and prosthodontic treatment. J Oral Rehabil, 27(8), 647–659. https://doi.org/https://doi.org/10.1046/j.1365-2842.2000.00623.