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The Role of Canine Guidance in the Management of Tooth Wear Associated with Bruxism: A Pilot Study

El Rol de la Guía Canina en el Manejo del Desgaste Dental Asociado al Bruxismo: Un Estudio Piloto

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ABSTRACT: Bruxism is a condition characterized by a motor activity which can indicate some physiological changes. Due to its multifactorial nature, bruxism can be associated with various signs and symptoms, including tooth wear. The aim of this study was to evaluate the effectiveness of restoring the canine guide in controlling tooth wear in patients with bruxism. This is a pilot study of 24 patients with bruxism, loss of canine guidance and no complaints of pain. The patients were divided into two groups: G1 (n=12, restoring of the canine guide) and G2 (n=12, guidance for patients with bruxism), evaluated at 1, 3 and 6 months, respectively. In the inter-group analysis, no statistically significant values were observed (p>0.05). In the intra-group analysis, a difference was observed in G1 (p=0,023) and G2 (0,018) between 1, 3 and 6 months in the assessment of tooth 23. However, the post-hoc analysis revealed that this difference was statistically false, configuring a statistical paradox. Based on the results obtained, restoring the canine guide did not prove to be effective in controlling tooth wear associated with bruxism. Due to the limitations of the study, such as the sample size, clinical trials with a larger number of participants are needed to validate or refute these findings.

KEY WORDS: Bruxism, dental occlusion, conservative treatment.

INTRODUCTION

Bruxism is a condition characterized by a motor activity which can indicate physiological changes (Lobbezoo *et al*., 2021). Sometimes it can be associated with hyperactivity of the chewing muscles, which can manifest as a habit of grinding and/or clenching the teeth and, when absent, repetitive jaw movements (Lobbezoo *et al*., 2018). According to the circadian cycle in which it occurs, it can be classified as Sleep Bruxism (SB) and Awake Bruxism, acting as risk and/or protective factors when observed in healthy individuals (Bracci *et al*., 2018; Bracci *et al*., 2024).

According to Standardised Tool for the Assessment of Bruxism (STAB), a tool developed by experts in the field of bruxism, the assess of bruxism depends on a careful assessment, considering the subject-based assessment (self-report), examiner report and instrumental assessment (technology report). In addition, it is necessary to associate these findings with possible risk and etiological factors, as well as some comorbidities that may be associated (Manfredini *et al*., 2024). Among the most common types of bruxism is SB, which affects around 3.5% to 49.6% of young individuals and 1.1% to 15.3% of adults (Melo *et al*., 2019).

Due to the multifactorial nature of bruxism and its non-dependence on the existence of teeth, the signs identified in patients can vary and coexist with other alterations. Among these signs that can be identified in certain patterns of bruxism, there are reports of tooth wear (Koyano *et al*., 2008; Kryger *et al*., 2011). In cases where bruxism generates occlusal forces greater than the maximum conscious clenching force, it can

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be a risk factor for dental fractures and Temporomandibular Disorders (TMDs) (van de Sande *et al*., 2016). It is possible to list some etiological factors that can trigger the condition, such as motor excitations that can cause sudden awakening, psychosocial factors (stress and anxiety), external factors (medication, smoking, alcohol and caffeine, for example), genetic factors and occlusal instabilities (Calderan *et al*., 2014). Some researchers have shown a relationship between malocclusions and the development or increased severity of bruxism, especially when there is a loss of balancing tooth movements and the equilibrium of masticatory loads (Henrikson *et al*., 1997; Sari & Sonmez, 2001).

Among these balancing movements are protrusion and laterality, which are performed thanks to the action of some teeth as guides, especially the canine guide (Davies & Gray, 2001; Singh *et al*., 2013). Canine guidance or canine function occurs when the canines are present in the arch with a desirable anatomy, allowing lateral forces to be dissipated due to their root length and denser bone support (Singh *et al*., 2013). In addition, it is worth highlighting the sensory input obtained by canine guidance, characterized by reduced muscle activity, preventing excess forces on dental and joint structures, minimizing the development of TMDs. In the case of patients with bruxism, these canine guides may be absent, making it difficult to balance occlusal forces (Davies &Gray, 2001; Abduo *et al*., 2013; Singh *et al*., 2013). In this context, some studies have pointed to the reestablishment of the canine guide as a low-invasive option that presents satisfactory results when the patient's well-being is assessed in relation to the complaints arising from bruxism (Akören & Karaagˇaçliogˇlu, 1995; Thumati *et al*., 2021). The aim of this study was to evaluate the effectiveness of canine guidance in controlling tooth wear in patients with bruxism.

MATERIAL AND METHOD

This is a pilot study carried out with patients diagnosed with bruxism according to the STAB tool (Manfredini *et al*., 2024) and based on a questionnaire adapted for patients with the condition (Winocur *et al*., 2011). A detailed description of the patients who completed the study can be found in Figure 1.

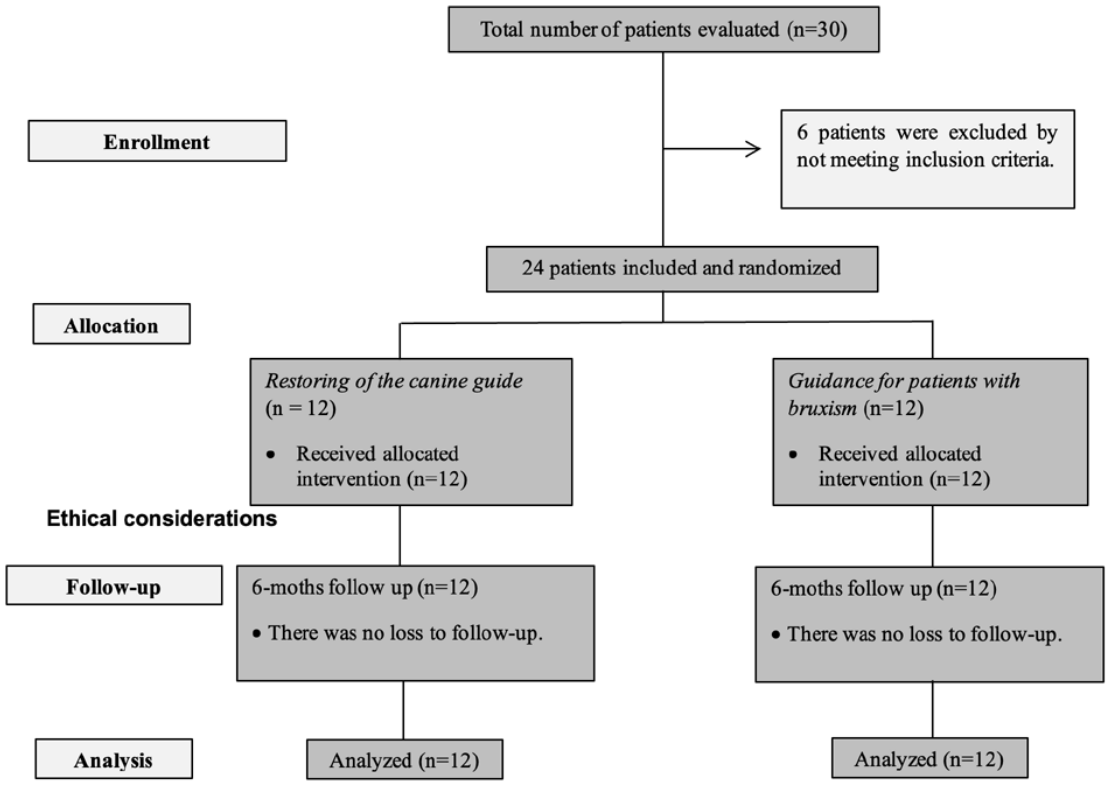

Fig. 1. Flowchart of sample distribution.

Ethical considerations. This study was conducted in accordance with the Consolidated Standards of Reporting Trials (CONSORT) (Schulz *et al*., 2010) and was approved by the Research Ethics Committee (REC) in full compliance with the Declaration of Helsinki, revised in 2013. All participants received explanations about the research and signed the Informed Consent Form.

Number of the ethical approval by the Research Ethics Committee (CEP): CAAE 73160223.0.0000.5108 – (6.319.950). Clinical Trial Registration: RBR-4qyw77g

Eligibility criteria. Patients with bruxism, over 18 years of age, who showed incisal wear during the clinical assessment, without complaints of pain and with reports of grinding or clenching of the teeth by family members and/or partners. Patients with TMD according to the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) (Schiffman *et al*., 2014), extensive dental rehabilitation and many missing teeth were excluded.

Sample size. To determine the sample size, the practical rules for sample size in pilot studies were adopted (Kunselman, 2024), with a recommended minimum of 12 per group. The sample size was therefore 24 subjects. The participants were divided into two groups: Group 1 (n=12): Patients who had the canine guide restored with composite resin and Group 2 (n=12): Patients who received guidance for patients with bruxism.

Randomization, allocation concealment and masking. Randomization was carried out by an independent researcher, who was not directly involved in the research, using a simple draw divided into 12 blocks with 2 patients each. The selection of the intervention for each patient was defined at the time of the appointments. After this, one participant was allocated to G1 (patients with restoring canine guidance), which was attended by the same operator, and the other participant to G2 (guidance for bruxism), which was attended simultaneously by a second operator, duly trained, to standardize the information offered. Due to the characteristics of the study, masking was only carried out when setting up the database so that the statistical analysis could be carried out by a researcher who had no knowledge of the interventions applied to each patient.

Interventions

G1 - Restoring the canine guide. The canine guide was carried out by restoring the patients' upper canine teeth with a commercial composite resin so that the guide could be recovered. Initially, the operator selectively etched the enamel with 35% Potenza Attacco phosphoric acid (PHS do Brasil, Joinville, Brazil) for 30 seconds. The teeth were then washed thoroughly and dried with absorbent paper. Once this was done, the Ambar Universal adhesive system (FGM, Joinville, Brazil) was applied with a disposable brush and after waiting 30 seconds for the solvent to evaporate, it was polymerized for 20 seconds. Vittra APS Unique monochromatic resin (FGM, Joinville, SC, Brazil) was applied in a single increment and polymerized for 40 seconds. After restoring the completed canine guides, the monochromatic composite resins were finished and polished using polishing disks with decreasing grits and a Diamond master felt disk (FGM, Joinville, Brazil) and Potenza Specchi diamond paste (PHS do Brasil, Joinville, Brazil).

The height of the disocclusion was measured and standardized in the region between the first molars, not exceeding 2mm. For this, the R.O.C.A. System (Relacion Oclusal Centrica Armonica) was used, as proposed in the study by Mondelli *et al*. (2003) to control the distance offered for disocclusion of the posterior teeth. The result was guided by the aesthetics of the smile.

G2 - Guidance for patients with bruxism. The guidance was given to the patient by a single operator, according to the indications for patients with bruxism (Supplementary file).

G1 and G2 - Making acrylic resin molds for monitoring. After the interventions, sextant 2 was molded with Duralay acrylic resin in red (Fig. 2).

This mold was kept in filtered water throughout the study and used to assess the level of wear on the canines after the canine guide was reestablished after 1, 3 and 6 months, respectively. The wear assessment was carried out by a third researcher with the aid of an Iwasnson spectrometer (Golgran, São Caetano do Sul, Brazil), measuring the empty space between the incisal of the initial mold and the incisal of the patient's tooth (Fig. 3).

Statistical analysis. Statistical analyses were carried out using SPSS® for Windows® (Statistical Package for the Social Sciences Inc.) version 26. Exploratory data analysis provided frequencies, means and standard deviations. Normality was assessed using the Shapiro-Wilk test. Quantitative data was subjected to the Mann-Whitney test (for inter-group analysis) and

the Friedmann test (for intra-group analysis). Confidence intervals of 95% and a significance level of 5% were used.

Supplementary file. Guidance for patients with bruxism

Available at: https://www.eduardojanuzzi.com.br/dicas.html

Below you'll find guidelines for changing habits, behaviour and actions that can help improve your current condition.

1. Relax your jaw muscles:
- Try not to clench your teeth. Practice keeping your tongue on the roof of your mouth, behind your front teeth, your lips together and your teeth apart.
- Maintain good head, neck and back posture. This will help relax your jaw muscles.

2. Avoid habits that damage your muscles and joints:
- Don't bite your nails, pencils and/or other objects.
- Don't open hairpins or hold pins and/or clips between your teeth.
- Don't rest your chin on your hand for too long.

3. Change your diet:
- Avoid eating hard foods that you must chew for a long time.
- Don't chew gum.

4. Improve your sleep:
- Don't go to bed hungry. If you need to, a light snack before bed can help you fall asleep more easily.
- Avoid sleeping on your stomach or in other positions that strain your jaw and neck muscles.
- Don't drink too much alcohol before bed.
- Reduce your caffeine intake, as it can increase tension in your muscles, cause brain hyperactivity, irritability, stress and alter sleep phases.
- Occasionally, a sleep medication, when prescribed by a professional, can be useful. Its habitual use, however, should be avoided
- Sleep only as much as you need to feel rested the next day.
- Keep a regular sleep schedule. This means going to bed and waking up at the same time, both during the week and at weekends
- Keep the temperature in your room pleasant for you. A room that is too hot or too cold can disturb or interrupt your sleep.
- Don't keep trying to fall asleep, if you don't fall asleep, don't force it. This only creates a certain amount of anxiety, keeping you awake even longer. Get out of bed and do something different for a while. Go back to bed when you feel sleepy.
- Reduce the noise and light in your room.
- External noises, unwanted music and light can disturb your sleep or even make it lighter without waking you up completely.
- Avoid smoking, especially at night, because although cigarettes help calm a nicotine-dependent person, they also act as a stimulant that can disrupt sleep.
- Occasional exercise may not improve your sleep. Avoid heavy exercise 2 hours before bedtime.
- The level of activity during the day influences your sleep rhythm. Staying active during the day and doing pleasant things can help you sleep better.

5. Prevent stress and depression:
- Avoid too much information such as TV, social media, newspapers, magazines, radio, etc. Overstimulation is exciting and causes brain stress.
- Seek open environments for rest. Exposure to sunlight in the early morning or late afternoon increases the production of melatonin, a substance that regulates sleep/wakefulness and human mood.
- Invest in leisure time on weekends, vacations and vacations, getting out of the home/work routine as a way of restoring peace and quiet. Allow yourself moments of relaxation.
- Try to drink at least two liters of water a day. Avoid dehydration, which causes stress at the brain level.
- Don't use amphetamines and weight-loss drugs, as they can cause irritability, insomnia, aggression and depression.
- Try to talk more about your problems and feelings. However, if you identify something more serious, seek professional help from psychology and/or psychiatry.

Post-hoc test for tooth 23

Associations	p
G1 - Restoring of the canine guide	
1 month X 3 months wear	0,262
1 month X 6 months wear	0,185
3 months X 6 months wear	0,838
G2 - Guidance for patients with bruxism	
1 month X 3 months wear	0,414
1 month X 6 months wear	0,102
3 months X 6 months wear	0,414

Pairwise comparisons. Significance values were adjusted by the Bonferroni correction.

Fig. 2. Sextant 2 mold with red Duralay acrylic resin.

Fig. 3. Iwasnson spectrometer (Golgran, São Caetano do Sul, Brazil), used to measure tooth wear.

RESULTS

A total of 24 patients took part in the study, 12 of whom were allocated to G1 (Restoring canine guidance) and 12 to G2 (Guidance for patients with bruxism). The average age of the patients was 26.17 (± 7.13) and the sample included 12 (50%) women and 12 (50%) men. Among the patients' occupations, the majority reported being students (66.7%). The results of the evaluation of tooth wear after 1, 3 and 6 months are shown in Table I. The inter-group analysis showed no statistically significant results ($p<0.05$) (Table II).

The intra-group analysis showed a statistically significant p-value in G1 (p=0,023) and G2 (0,018) between 1, 3 and 6 months in the assessment of tooth 23 (Table III). A post-hoc test was therefore carried out to assess where the difference lay. However, the analysis did not reveal statistically significant results, making this difference a statistical paradox. The table with the post-hoc data can be found in the supplementary files.

DISCUSSION

The present study did not identify any statistically significant difference ($p>0.05$) between these interventions, revealing that in both groups there was tooth wear. These results corroborate Lobbezoo *et al*. (2018), indicating that bruxism goes beyond simple tooth contact, being predominantly regulated by the Central Nervous System (CNS), and not by anatomical factors such as dental occlusion and articulation (Manfredini *et al*., 2004; Manfredini *et al*., 2012; Lobbezoo *et al*., 2012). In the past, it was believed that occlusal imbalance was the main etiological factor in bruxism, leading dentists to recommend interventions such as occlusal adjustments, stabilization plates, orthodontic treatments or even oral rehabilitation, based on occlusal balance theories (Attanasio, 1997; Shetty *et al*., 2010). However, it is currently suggested that occlusion is not a factor that induces the frequency and intensity of bruxism, but rather CNS responses to emotional factors, life stressors or concomitant medical conditions, such as sleep apnea (Kuhn & Türp, 2018; Lobbezoo *et al*., 2025).

Despite the controversies in the literature, a pilot study of 36 patients diagnosed with SB showed favourable results for the association between occlusal factors and bruxism. This is because after occlusal adjustments, a reduction in the intensity of bruxism was observed (Thumati *et al*., 2021). The intensity of bruxism in these patients was assessed using T-Scan 10/BioEMG III technology and electromyography of the activity of the temporal and masseter muscles. The results found may be explained by the different assessment methods used in this study.

Table I. Evaluation of tooth wear in millimeters.

			Assessment period		
Intervention	**Patient**	**Tooth**	**1 month**	**3 months**	**6 months**
Restoring of the canine guide	1	13	0,0	0,3	0,3
		23	0,0	0,0	0,0
	2	13	0,4	0,6	0,6
		23	0,1	0,1	0.1
	3	13	0,0	0,0	0,0
		23	0,2	0,2	0,2
	4	13	0,0	0,0	0,0
		23	0,2	0,4	0,4
	5	13	0,3	0,3	0,5
		23	0,3	0,5	0,5
	6	13	0,0	0,0	0,0
		23	0,0	0,0	0,0
	7	13	0,1	0,1	0,1
		23	0,2	0,2	0,2
	8	13	0,1	0,1	0,1
		23	0,1	0,1	0,1
	9	13	0,0	0,0	0,0
		23	0,0	0,1	0,1
	10	13	0,0	0,0	0,0
		23	0,0	0,0	0,0
	11	13	0,0	0,0	0,0
		23	0,0	0,2	0,3
	12	13	0,4	0,4	0,4
		23	0,2	0,2	0,2
Guidance for patients with bruxism	1	13	0,2	0,2	0,2
		23	0,2	0,2	0,2
	2	13	0,2	0,4	0,4
		23	0,4	0,6	0,6
	3	13	0,0	0,0	0,0
		23	0,0	0,1	0,1
	4	13	0,0	0,0	0,0
		23	0,2	0,2	0,2
	5	13	0,1	0,2	0,3
		23	0,2	0,2	0,3
	6	13	0,0	0,0	0,0
		23	0,0	0,0	0,0
	7	13	0,2	0,4	0,4
		23	0,2	0,2	0,4
	8	13	0,1	0,1	0,1
		23	0,2	0,2	0,2
	9	13	0,0	0,0	0,0
		23	0,2	0,2	0,2
	10	13	0,6	0,6	0,6
		23	0,4	0,4	0,4
	11	13	0,6	0,6	0,6
		23	0,2	0,4	0,5
	12	13	0,3	0,3	0,3
		23	0,2	0,2	0,2

Table II. Inter-group analysis.

		Group 1 vs. Group 2		
Assessment time	**Tooth**	**Mean**	**SD**	**p**
1 month	13	0,15	±0,19	0,291
	23	0,15	±0,12	0,101
3 months	13	0,20	±0,22	0,443
	23	0,20	±0,15	0,198
6 months	13	0,20	±0,22	0,443
	23	0,22	±0,17	0,143

Note: Mann Whitney test. $p<0.05$ considered statistically significant.

Table III. Intra-group analysis.

		Group 1		Group 2	
Assessment time	**Tooth**	**Mean**	**SD**	**Mean**	**SD**
1 month	13	0,10	±0,16	0,19	±0,21
3 months	13	0,16	±0,22	0,23	±0,22
6 months	13	0,16	±0,22	0,24	±0,22
p		0,05		0,061	
1 month	23	0,10	±0,10	0,20	±0,12
3 months	23	0,16	±0,15	0,24	±0,15
6 months	23	0,17	±0,16	0,27	±0,17
p		0,023*		0,018*	

Note: Friedman test. *p<0.05 considered statistically significant.

Furthermore, a clinical trial carried out to assess the relationship between the balancing movements of dental forces and muscle activity, which is very common in patients with bruxism, concluded that the canine guide, although it did not show statistically significant values, is the one that most promotes balance in the face of muscle hyperactivity (Akören; Karaagaçlioglu, 1995). The relationship between the working side and the non-working side, when not occurring in harmony during occlusion of the teeth, can be one of the etiological factors that stimulate bruxism (Thumati *et al*., 2021). The assessment methods included monitoring with the Grindcare® device (Medotech) and the Brux Checker occlusion checker (Scheu).

The sample evaluated in this study was made up of 12 men and 12 women, and the overall mean age was 26.37 (±7.13). The epidemiology of bruxism is complex due to the difficulties in validating the diagnosis, which in some studies is based solely on patients' self-reporting. Thus, it is not possible to establish a clear relationship with factors such as gender and age, only that there is a common tendency for prevalence to decrease with age (Manfredini *et al*., 2013a; 2013b). In this context, current literature suggests that bruxism should be assessed beyond the simple “present or absent” dichotomy, considering that the different motor activities associated with bruxism need to be analyzed separately (Svensson *et al*., 2017).

The use of acrylic resin to make the molds contributed positively to the evaluation of incisal wear. Although some studies have reported polymerization contraction of this material (Ehrenberg *et al*., 2006; Balkenhol *et al*., 2008), further research has shown that this contraction is compensated for by the hygroscopic expansion of acrylic resin when stored in water, provided it is thick enough not to fracture (Barbosa *et al*., 1995). In addition, the acrylic resin used was red in color, which made it easier to see when measuring incisal edge wear.

Among the limitations involved in this work is the fact that it is a pilot study, from which the real effectiveness of a treatment cannot be established, since the main aim is to assess the feasibility of a clinical trial using the same interventions and target audience (Thabane *et al*., 2010). A small sample size can mask the results of clinical interventions. In this case, Randomized Clinical Trials (RCTs) with an adequate sample size have the power to reveal statistically significant results with greater reliability (Kjaergard *et al*., 2001). Another limitation observed in the study refers to the aesthetics of the canines after the guide has been restored. In certain cases, the correction of teeth 13 and 23 resulted in a disproportionate size and, to maintain an aesthetic balance, it was necessary to apply resin to the lower canines. Another important point to consider is that tooth wear, like bruxism, is multifactorial. In this case, the existence of wear may be associated with other factors such as gastroesophageal reflux disease and an acidic diet (Hattab &Yassin, 2000; Leven &Ashley, 2023).

From this pilot, it was realized that, depending on the degree of severity of bruxism in some cases, early resin fracture can occur, which compromises the control and assessment of tooth wear (Schneider *et al*., 2007). In this context, direct communication between the researcher and the patient is essential to resolve the situation as quickly as possible. To make it possible to assess this intensity of muscle strength and the severity of bruxism, electromyography could be used in a future clinical trial to compare it with the level of tooth wear (Colonna *et al*., 2022).

CONCLUSION

In the 24 patients evaluated, it was observed that the restoring of the canine guide was not effective in controlling tooth wear caused by bruxism. In view of the results found and knowing the limitations of the study presented, it is suggested that future clinical trials with appropriate methodology could present more robust results regarding the role of the canine guide in controlling bruxism.

Authors' contributions. BLS: Conceptualization, Formal Analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. Carried out one of the interventions, analyzed the data and was a major contributor in writing the manuscript. SSO: Conceptualization, Methodology, Writing – original draft. ICS: Methodology, Writing – original draft. JAS: Methodology, Writing – original draft. DWDO: Methodology, Writing – original draft. AMB: Conceptualization, Writing – original draft, Writing – review & editing. ODF: Conceptualization, Formal Analysis, Supervision, Writing – original draft, Writing – review & editing. KTAT: Conceptualization, Writing – original draft, Writing – review & editing.

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RESUMEN: El bruxismo es una condición caracterizada por una actividad motora parafuncional, que puede reflejar cambios fisiológicos subyacentes. Debido a su etiología multifactorial, el bruxismo se asocia con una amplia variedad de signos y síntomas, incluido el desgaste dental. El objetivo de este estudio fue evaluar la efectividad de la restauración de la guía canina en el control del desgaste dental en pacientes con bruxismo. Este estudio piloto incluyó a 24 pacientes diagnosticados con bruxismo, pérdida de la guía canina y sin reporte de dolor. Los participantes fueron asignados aleatoriamente en dos grupos: G1 (n = 12, restauración de la guía canina) y G2 (n = 12, consejería a pacientes con bruxismo). Las evaluaciones clínicas se realizaron a los 1, 3 y 6 meses. El análisis intergrupal no reveló diferencias estadísticamente significativas (p > 0,05). El análisis intragrupal mostró cambios tanto en G1 (p = 0,023) como en G2 (p = 0,018) a lo largo del tiempo en la evaluación del diente 23. Sin embargo, el análisis post hoc indicó que estas diferencias no fueron realmente significativas, lo que sugiere una paradoja estadística. Dentro de las limitaciones de este estudio, la restauración de la guía canina no demostró ser efectiva en el control del desgaste dental asociado al bruxismo. Dado el tamaño reducido de la muestra, se requieren ensayos clínicos con cohortes más amplias para validar o refutar estos hallazgos.

PALABRAS CLAVE: Bruxismo, oclusión dental, tratamiento conservador.

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